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CONTENTS.

EDITORIALS:

The Convention of the Electric Vehicle Association..... 741
Co-Operation with Schools..... 742
Financing with Commercial Paper..... 742
License Laws for Electrical Contractors..... 743
The Greatest Utilization of Hydroelectric Power..... 743

DEPARTMENTS:

Commercial Practice 751
Electrical Construction 755
Public Service Commissions..... 758
Questions and Answers..... 759
New Electrical and Mechanical Appliances..... 772
Current Electrical News..... 779
Record of Electrical Patents..... 783

LEADING ARTICLES:

Electricity in Harvesting Machinery Manufacture..... 745
Business Hints for Dealer and Contractor.—By G. D. Crain, Jr. 755
Thirteenth Annual Jovian Convention..... 761
Electric Vehicle Association Meets..... 764
Progress on the Electrification of the Chicago, Milwaukee & St. Paul Railway..... 769

MISCELLANEOUS:

American Association of Engineers Prepares for Convention 744
February Convention of Illuminating Engineers..... 744
Prosperity Festival in Louisville..... 744
Massachusetts Hydroelectric Companies Under State Supervision 744
An Electric-Range Campaign That Paid..... 751
Valuation of Milford Utility Property..... 751
New Lighting Installation in Waltham Employs Gas-Filled Lamps 752
New Quarters of Haverhill Electric Company..... 752
Simplified Rate Schedule of Springfield..... 753
Results of 30-Day Iron Campaign at Malden..... 753
Original Window Display Attracts Attention..... 754
Prize Window Display of New York Edison Company..... 754
Co-operation Between Contractors and Central Stations..... 756
New Electrical Code for New York..... 756
Portland Code 757
Among the Contractors..... 757
Civil Service Examination for Fire-Prevention Inspector.. 763
Hydroelectric Problems Considered at Philadelphia Meeting of American Institute..... 763
Load Dispatching at Boston Described..... 767

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CONVENTION OF THE ELECTRIC VEHICLE ASSOCIATION

It is seldom that so much of real value is accomplished at an annual convention as was true of the sixth annual meeting of the Electric Vehicle Association of America at Cleveland, O., on October 18 and 19. Many of those prominent in the business who attended the convention expressed the opinion that it marks a new epoch in the electric-vehicle industry. Certainly a degree of co-operation was in evidence that unfortunately has been lacking in the past. It may perhaps be considered as a sign of the times that the representation of central-station men exceeded any other class and on every hand comprehensive offers of co-operation were made.

An admirable report of the committee appointed to suggest means for a closer co-operation between the central stations and other branches of the electric-vehicle industry offered specific suggestions for channels of co-operation. The question was raised by President Lloyd of the National Electric Light Association, who was the guest of the convention, whether those companies, members of the Vehicle Association and represented at the convention, were not already cognizant of the benefits to be derived by co-operation such as outlined. The problem of bringing this report as well as other information presented at the convention, to the attention of central-station companies generally, coupled with an invitation of Mr. Lloyd for the Electric Vehicle Association to co-operate more closely with the National Electric Light Association, suggested the thought in the minds of many of those present whether some sort of working agreement or affiliation with the latter organization could not be effected. While no one who has followed the destinies of the Electric Vehicle Association could question the wonderful accomplishments that have been effected through its influence, still there seems to be a vast field for enlisting the consideration and co-operation of the central stations in the medium-sized and smaller cities. With its remarkable organization, the National Electric Light Association is in an excellent position to assist the vehicle organization in this work, and it is hoped that without sacrificing its identity the Electric Vehicle Association can widen the scope of its activities through a closer co-operation with the former body.

While representing only a comparatively small field in the vehicle industry, the electric taxicab came in for a considerable amount of discussion at the convention.

A paper presented by a representative of a taxicab company in Detroit indicated that remarkable results are being attained and that the electrically propelled vehicle is not only more economical, more reliable and more easily controlled, but the public has shown a decided preference for the electric vehicle where the opportunity for a choice has been given. This emphasizes the enormous advertising value to the electric-vehicle industry were such service to be extended to all the principal cities. It seems that the industry could well support the propaganda of electric taxicabs with this feature alone as a reward.

Another most important subject which seemed to rise to the surface in practically all of the discussions was that of battery service. Despite the claims of many in the industry that the electric vehicle is foolproof, requires little or no attention, and can be operated even by a child, experiences have shown that expert battery attention is necessary if the electric vehicle is to fulfill its duties in a satisfactory manner. Battery-service systems providing either for the outright rental of the battery to the user, or for exchanging charged batteries for discharged batteries at a cost based on mileage or kilowatt-hours, eliminate the possibility of inattention or improper use by the customer, and will undoubtedly do more to increase the serviceability and satisfaction of the electric vehicle than any other one item. Reports from various parts of the country indicate that serious consideration is being given this subject either by central-station companies, battery companies or garages, and that wherever tried the success has been unqualified. From the trend of the discussions on the floor of the convention it is apparent that the development of the industry will largely hinge on the extension of such service systems.

CO-OPERATION WITH SCHOOLS.

It is a byword that the luxuries of one generation become the necessities of the next. We have had ample evidence of the truth of this statement in the use of the conveniences of the home which are supplied by the electric current. The child who grows up in a home equipped with telephone service and electric light regards these as necessities and when he grows up would not think of having a home of his own which was not at least as well equipped with these facilities.

The impressions made in childhood are the most lasting ones. This is so true that the facts noted in the preceding paragraph are sometimes reversed to the extent that the parent insists that what sufficed in his own childhood must be good enough for his children, regardless of the intervening progress in facilities, ideas or pedagogical standards.

Those interested in the greater development of the electrical industry will do well to bear these facts in mind and take every opportunity to co-operate with schools and similar institutions in extending the use of electrical appliances, as it is here that the most lasting results can be accomplished. Every electrical man should interest himself in seeing that local schools are equipped with electrical apparatus in every way possible, and this may even advantageously extend to the point of supplying equipment at cost or of even donating it in cases where school funds are not available for supplying the desired equipment. Furthermore, no opportunity should be lost in co-operating with school authorities in planning instruction in electrical subjects and of suggesting methods of instruction, not only on the scientific side of the subject but in its application for household, commercial and industrial purposes.

Vocational schools and vocational education are being rapidly extended in this country and no vocational school should be without a course in electricity. The planning of such a course can often be benefited by the consultation of those actively engaged in the industry, and every opportunity should be taken to extend this co-operation where school authorities desire it.

FINANCING WITH COMMERCIAL PAPER.

The past 18 months have witnessed considerable difficulty among central stations in securing the necessary capital for making extensions, even when such extensions are fully warranted by prospective business or business actually contracted for. This has applied especially to the issuance of permanent securities to cover such uses of capital. Even in normal times many central stations, like other utilities, have financed extensions by issuing commercial paper until the volume of the latter has warranted its refunding by the issuance of bonds or stock. By choosing a favorable time for such issuance, they can be marketed to the best advantage. Such a practice has been especially advantageous during the period referred to, since lower interest rates have been in vogue for commercial paper than for bond issues even when well secured in the most stable companies. While present conditions continue it would therefore seem advisable to, as far as possible, finance all extensions by temporary notes, and postpone the issuance of the usual securities until such time as a favorable market can be secured.

The same considerations apply to the furnishing of working capital for carrying along the ordinary business transactions of the utilities. Such funds may well be procured from the disposal of short-time notes which can be renewed from time to time. The permanent securities issued can in this way be limited to values more nearly in correspondence with the physical property of the corporation. Under present conditions the securing of funds from this source is the most advantageous method. Where commission regulation is in vogue and the income of utility corporations is based upon an actual valuation, allowances are usually made for working capital as well as for intangible values. The percentage return upon the valuation is seldom limited to values below 7 or 8 per cent. If the funds in question are borrowed upon a basis of 5 or 6 per cent it is evident that an advantage will thereby accrue to the stockholders.

LICENSE LAWS FOR ELECTRICAL CONTRACTORS.

The need for license laws covering the work of electrical construction has been apparent for some time in this industry. Progress has already been made to some extent and certain states have passed state laws, while cities in other localities have passed local ordinances with the object of restricting the prosecution of this work to the hands of those who are competent to carry it out, and who have sufficient knowledge of wiring regulations to see that the finished work will comply therewith. These restrictions are very properly placed upon the prosecution of electrical construction in the interest of safety to the public, for it is conservative to say that nearly all of the fires which have been correctly attributed to electrical origin arose from defective wiring; that is to say, the use of defective material or else installation in contravention to the requirements of the National Electrical Code.

License laws, like any other laws, are worse than useless unless they are enforced. For the desired benefits to follow the enactment of such legislation it is essential that rigid enforcement should follow and this will only occur when there is a competent official with both the power and the interest to see that the provisions of the law are properly carried out. Where such interest does not already exist in the proper official it can be stimulated by the activity of local associations. Such bodies should take it upon themselves wherever it appears necessary to discover cases of violation, report them to the proper official, and insist upon the enforcement of the law.

In considering the desirable provisions of a license law, advantage may well be taken of what experience has already been gained in those communities that have already had legislation along this line. To secure the greatest protection an examination as to knowledge and experience in the work should be made one of the necessary prerequisites for securing a license. In addition to this it is sometimes provided that a bond should be filed by the contractor securing a license for the faithful performance of his work in conformity to the regulations. While this may sometimes be desirable, it seems likely that in most communities it will be more effective to provide for a fine and for the revoking of the license in cases of failure to adhere to the regulations, whether this failure be due to ignorance or to wilful attempts to install defective material or to do work which does not comply with the code.

The requirement of prior examination and the power to revoke the license are the two provisions which are most necessary for application to both employing contractors and to journeymen wiremen.

The benefits of a suitable law which is rigidly enforced accrue not only to the public but to responsible and competent contractors and wiremen and to the electrical supply houses. The contractor is protected from the competition of those who have not sufficient knowledge and experience of the business to properly estimate their costs and also from those who wilfully install shoddy material. The supply man is protected from the same type for it is this type that involves him in the largest percentage of his losses.

THE GREATEST UTILIZATION OF HYDROELECTRIC POWER.

Two of the papers at the Philadelphia meeting of the American Institute of Electrical Engineers last week dealt with the use of steam plants in supplementing the output of hydroelectric stations and both pointed out the feasibility of utilizing steam plants in this way, even when the steam equipment is not owned by the hydroelectric company, but by one or more customers. The scheme seems to work out best when the customers of the hydroelectric company are local distributing companies which buy their power in bulk and retail it. In many cases such companies have old steam equipment which is still serviceable, even though incapable of attaining the high efficiency of units of more modern design. As supplementary units to carry the load during peak hours or during seasons of low water, such equipment may be entirely adequate, since the first consideration for such intermittent service is investment and fixed charges rather than fuel cost.

Arrangements for hydroelectric supply can often be made for a large portion of the year if there be possibilities of supplementary steam supply to take care of winter peaks and seasons of drought. Steam stations are often demanded for stand-by purposes anyhow, and can be made to serve their greatest usefulness by provisions for mutual interchange of power between customer and hydroelectric company.

One of the most interesting features involved in these relations is the extent to which hydroelectric development shall be carried. In many cases such development has been limited, where storage facilities are out of the question, by the minimum flow of the stream. Even where there is no steam supplement, however, such conservatism is not always warranted. Low-water periods usually occur in the late summer, while peak loads, at least where lighting predominates, reach their extreme maxima during the winter months. The capacity for supplying such peaks may not be too great for the available supply at such times, even though it could not be utilized at the periods of low water. But at the latter periods it may not be required.

With the auxiliary steam plants this idea may be carried much further, and development carried out to a point representing possible utilization for a substantial part of the year, even though dependence must be put upon the steam equipment for more than emergency service. Only through the most complete co-operation of steam and hydraulic plants, even when under different ownership, can the most complete and most economical utilization of the available water power be made.

American Association of Engineers Prepares for Convention.

Plans for the national convention of the American Association of Engineers to be held in Chicago December 10-11 are being rapidly completed. All engineering societies have been invited to send official representatives to the convention to join in the discussion and assist in attempts to solve a few of the welfare problems confronting the engineer.

A National Membership Committee has been selected to push the organization of local chapters in various parts of the United States. Those appointed on the committee are A. H. Krom, assistant engineer, Illinois State Public Utilities Commission; F. H. Newell, professor of civil engineering, University of Illinois; S. Steenerson, engineer, Minnesota Highway Commission; Edwin R. Webster, Marion, Iowa; Daniel B. Luten, Indianapolis; O. L. Dent, Bemidji, Minn.; R. A. West, Tye River, Va.; Israel L. Beerman, engineer, New York State Highway Commission; Harold Almert, Chicago; W. N. Winter, Hood River, Ore.; H. L. Holderman, Lewistown, Mont.; Ernest McCullough, Chicago; George C. Keech, Chicago; A. T. North, Chicago.

Owing to the increase in its activities the Association has taken larger quarters at 29 South La Salle Street, Chicago.

The Service Clearing House is actively engaged in putting the engineer in touch with the employer and the employer in touch with the man without charge. One of the largest electrical manufacturing companies in the United States has given the Association the preference in filling all vacancies which require men of technical training.

McCall Raps Chronic Agitators.

Joseph B. McCall, president of the Philadelphia Electric Company, addressed the members of the Philadelphia Jovian Electrical League at the weekly luncheon at the Hotel Adelphia in Philadelphia recently, and paid his respects to professional agitators in some communities who wage war against public utility companies, actuated either by motives of political gain or private profit.

Mr. McCall paid high tribute to the men engaged in the electrical field. He told of the responsibilities devolving upon them and added, "There is no set of men in any line imbued with such honesty of purpose, endowed with greater intelligence, or more anxious to serve their communities than those directing or employed by electric companies."

"The men in charge," he said, "serve the public, the representatives of the municipalities and the stockholders. On the other hand, they are opposed by professional agitators, who are aligned against the business and wish to destroy or lessen its efficiency. I deplore these attacks made about the country on the industry. These men who criticize do not have to satisfy both the public and the stockholders at the same time. All of these critics are not in public life, but they take the opportunity to "knock" and condemn. But all are inspired either by a desire to gain political ends or for private profit."

February Convention of Illuminating Engineers.

A meeting of the Council of the Illuminating Engineering Society was held October 14 in New York City.

After considering the appointments to various committees for the present year, preliminary plans were discussed for the holding of a semi-annual convention in New York next February to mark the tenth anniversary of the organization of the society.

It was also planned to arrange for the presentation of a course of lectures on illuminating engineering similar to the course which was given in the fall of 1910 at the Johns Hopkins University under the auspices of the society.

The programs of papers and meetings for the various sections of the society were read and discussed briefly by the vice-presidents representing the various sections of the society.

Prosperity Festival in Louisville.

Louisville Jovians, after having thoroughly canvassed the local situation with the heads of the various commercial organizations of the city, have decided to take the lead in promoting Electrical Prosperity Week in Louisville and to bear whatever expense will be incurred. This announcement was made at the regular weekly luncheon at which not only the Jovians but representatives of the newspapers and others interested in the proposition were present. Definite plans will be formed and announced shortly and the work of preparation for a big attention-getting celebration will begin.

At the luncheon Donald McDonald, vice-president and general manager of the Louisville Gas & Electric Company, spoke on the subject of prosperity, which he said was imminent.

The sooner all people realize that conditions in this country are sound, he said, the sooner prosperity will reach all individuals in it. Toward the conclusion of his address Mr. McDonald stated:

"I believe that Electrical Prosperity Week will do much to hasten this day. To the company which I represent it has already come. Manufacturers are taking larger amounts of electric power; with this they are driving more machines and employing more men to run the machines. The men draw wages and part of these they spend for electricity for light and for gas, with which to make their homes comfortable. Every month that passes gives increased evidence of this tendency. I hope the same condition of affairs prevails in the business of all those to whom I am speaking."

Part of the plans of the Louisville Jovians, of which league Robert Montgomery is president, provide for a "Prosperity Festival" at the Armory, the largest hall in Louisville, where it is proposed to have displays of electrical appliances, etc.

Massachusetts Hydroelectric Companies Under State Supervision.

In addition to the returns rendered to the State Gas and Electric Light Commissioners by the Massachusetts lighting corporations and the municipal plants, the hydroelectric generating and transmission companies this year for the first time rendered their reports of business for the year which ended June 30, 1915. The supervision of the Commission over these corporations was provided for by a law which passed the legislature of 1914, and which became effective August 1, 1914.

Operations for the year 1914-15 indicate a large and successful business, most of which is the development of but a decade or so. The Connecticut River Transmission Company, which operates plants of the New England Power Company on the Deerfield River, had a total output of 125 million kilowatt-hours. It sold about 52 million kilowatt-hours for motor service, 28 millions to street railways and 29 millions to other companies and municipal plants. Earnings were practically one million dollars. The company not only procured energy from the Deerfield River plants but also purchased 6 million kilowatt-hours from the state's generating plant at the Metropolitan reservoir, and 5 million kilowatt-hours from the Berkshire Street Railway Company, besides smaller quantities from the Worcester, Fitchburg and other lighting companies. By the economical interchange of product, low prices are possible to industrial concerns in the state. For large quantities of energy, the price is as low as 4 mills per kilowatt-hour, while the average price ranges around one cent.

One result of the extensive hydroelectric development in Massachusetts has been a marked stimulus to industrial activity.

Industrial Power Series—Article No. 142.

ELECTRICITY IN HARVESTING MACHINERY WORKS.

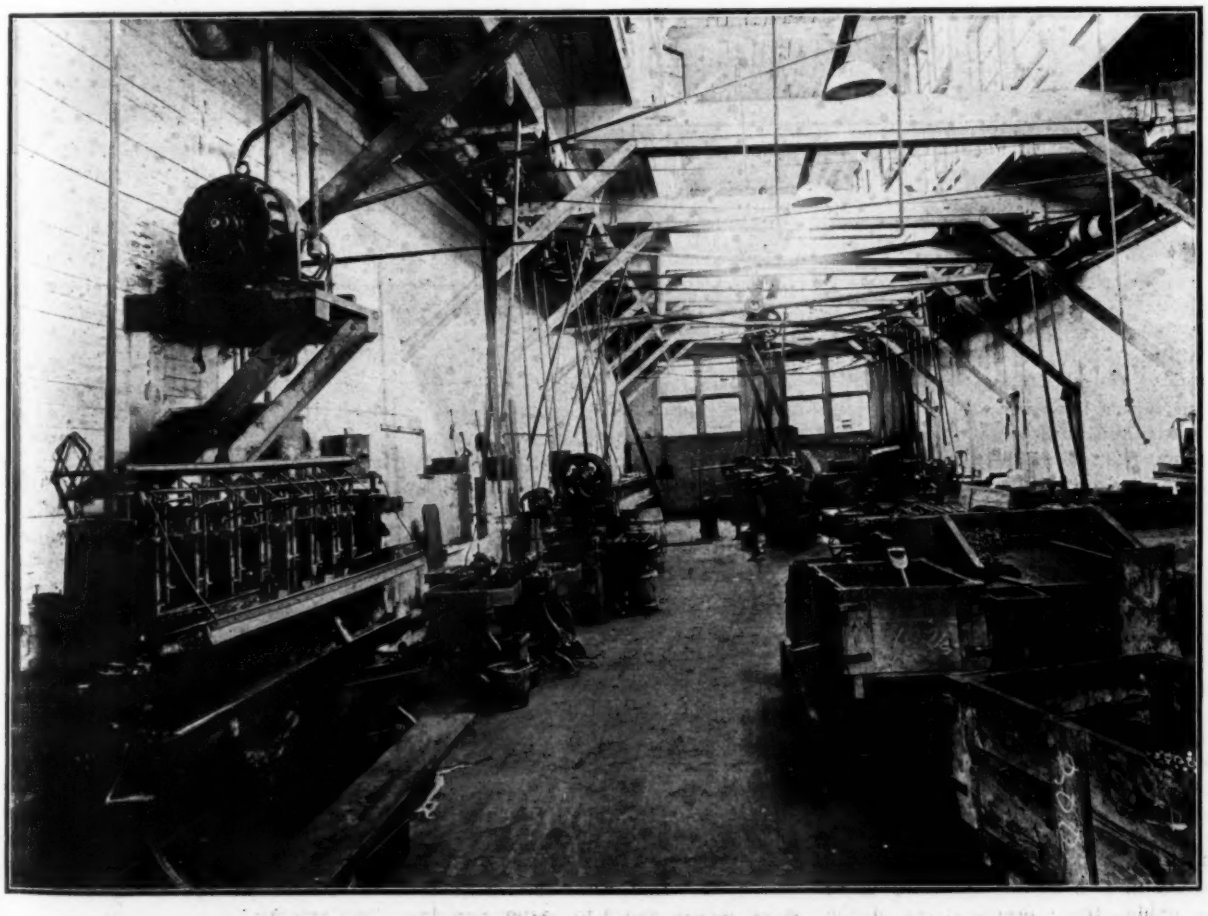
This article describes the processes involved in manufacturing harvesting machinery and points out the advantages of electric motor drive. The plant of the International Harvester Company at Auburn, N. Y., is described in detail with reference to the motor equipment, power consumption, etc.

The International Harvester Company is so well known that it needs no introduction, but a few facts regarding the Osborne works of this company at Auburn, N. Y., may not be amiss. In that city there are three mills designated at Nos. 1, 2 and 3, which are located in various parts of the city and connected by the Owasco River Railroad, the latter connecting with the New York Central and the Lehigh Valley Railroads. All three mills cover several acres of ground, and consist of groups of buildings of from one to five stories in height.

In the No. 1 mill, grain, grass and corn machines are manufactured, which consists of binders, mowers, hay tedders, hay rakes and corn binders. The No. 2 mill is devoted to the manufacture of tillage machinery, and the No. 3 mill manufactures binder twine, and was described in the September 15, 1915, issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

No. 1 mill, the subject of this article, is located in the central part of the city, on the banks of the Owasco River, with the main office building fronting on one of the principal business streets. Formerly mechanical drive was used entirely, part water power and part steam power. The water power is utilized to some extent at the present time, but steam power has been replaced by 27 electric motors, ranging from one-half to 75-horsepower, with an aggregate horsepower rating of 902.5. All the motors are alternating-current induction motors of the squirrel-cage, slip-ring, and internal-resistance types. Service is furnished by the Empire Gas & Electric Company from its three-phase, 60-cycle, 2,200-volt mains, and with the exception of some of the smaller motors all are operated at a potential of 2,080 volts.

All electrical construction work in the buildings is of the most approved type, and safety devices are used wherever possible. It is well known that the International Company was one of the pioneers in the "safety first" campaign, and a visit to any of its mills bears out this fact. The use of



Nut-Tapping Department Driven by 15-Horsepower Motor.

central-station service and electric drive have resulted in a large power saving, increased production, and better control of the power in the various buildings and departments.

To gain a comprehensive idea of what electric power has to do with the manufacture of agricultural implements it will be necessary to describe briefly the output of the company, and to outline the various processes and manufacturing conditions. One of the interesting features of the No. 1 mill is the high load-factor maintained, which is no doubt partially due to the diversified character of the machinery, the fact that the parts made are small, so that machines are not necessarily kept idle for long periods while placing the work to be machined in position, but may be principally attributed to the various heads of departments, who maintain a high state of working efficiency and a high ratio of production. These department heads are directly under the supervision of Walter H. Beck, superintendent.

While on a recent inspection trip of the No. 1 mill the writer stopped a busy expert long enough to ask him what gave manufactured products their supremacy. The reply was: "Men, equipment and keeping ahead of the times." The building of farming machinery is not a simple engineering proposition, like constructing a bridge, or a locomotive, where all factors are constant. The farming machine has to meet every known condition of soil, water and vegetation, and the only way to meet these conditions is by long experience. One department head stated that every effort is made to keep the working conditions as favorable as possible, such as freedom from dust, abundance of light, plenty of fresh air, and the provision for safety, all of which are necessary to bring the product up to a standard which will meet the requirements outlined.

The use of electricity for light and power materially aids in maintaining ideal working conditions, and this leads to a discussion of the real advantages of electric power in manufacturing establishments, especially where central-station service is used. One striking fact is that since the introduction of the present power equipment in the No. 1 mill there has been a saving of between four and five hundred horsepower. There are several reasons for this saving: Formerly the power was transmitted mechanically from central points, necessitating the use of heavy shafting and belting, some of the belts reaching five feet in width. This, of course, was the cause of large friction losses, which have been greatly reduced by the elimination of the heavy transmission, and dividing the smaller shafting and driving the machinery in groups. Four hundred horsepower for a 10-hour working day is equivalent to 2,980 kilowatt-hours and at as low a rate for service as two cents a kilowatt-hour there is a net saving for power of $59.60 daily.

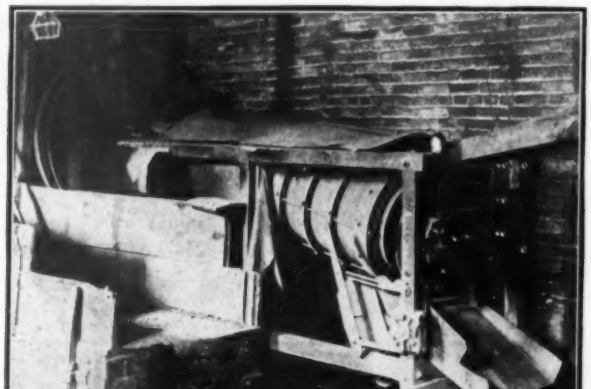
Another feature to be considered is that the elimination of heavy mechanical transmission from a central point is the means of doing away with belt shafts from floor to floor, which are always a menace in case of fire, as the flames quickly spread from floor to floor through such shafts. In such locations as that of the No. 1 mill the value of real estate is high and the space formerly occupied by the steam plant can be utilized for manufacturing purposes. By doing away with the steam plant the salaries of engineers and helpers are eliminated, as well as depreciation of the machinery and power plant repairs, and other incidentals are no longer factors to be considered.

If any one department shuts down the expense for power in that department ceases, and in case of overtime work in any department long lines of shafting and heavy belting do not have to be kept in operation, as the electric motor is ready to start or stop at any time, and as soon as stopped the power expense stops. The general efficiency of electric power is greater than that of mechanical power and it is reasonable to say that a large public utility with extensive power stations can sell energy cheaper than power can be developed in a smaller plant for private use.

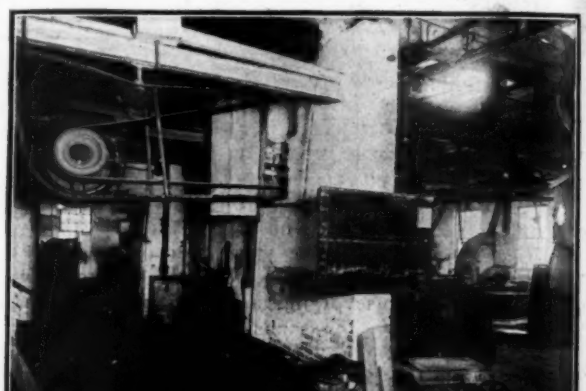
In reference to the motors, they are quickly and cheaply installed, and can be changed from one location to another in a short time. They require no stone or brick foundations and can be mounted in a position that does not occupy working space. The flexibility of electric drive is an important factor to be considered, and together with other advantages make this form of power ideal for all manufacturing establishments.

A brief description of the harvesting machines made at this plant may be in order. The New Osborne binder cuts and binds the grain and deposits the bundles at intervals on the fields. The cutter may be roughly compared to hair clippers on a huge scale, and consists of a series of triangular knives mounted in a horizontal row, which have an oscillating motion imparted to them by the mechanism as the binder is drawn along by horses. The knives move between guards. A revolving reel turns the grain toward the machine, and as the grain is cut it falls on a platform consisting of an endless traveling belt, which bundles the grain with the aid of other mechanism, and when a sufficient quantity is bundled it is automatically tied with binder twine.

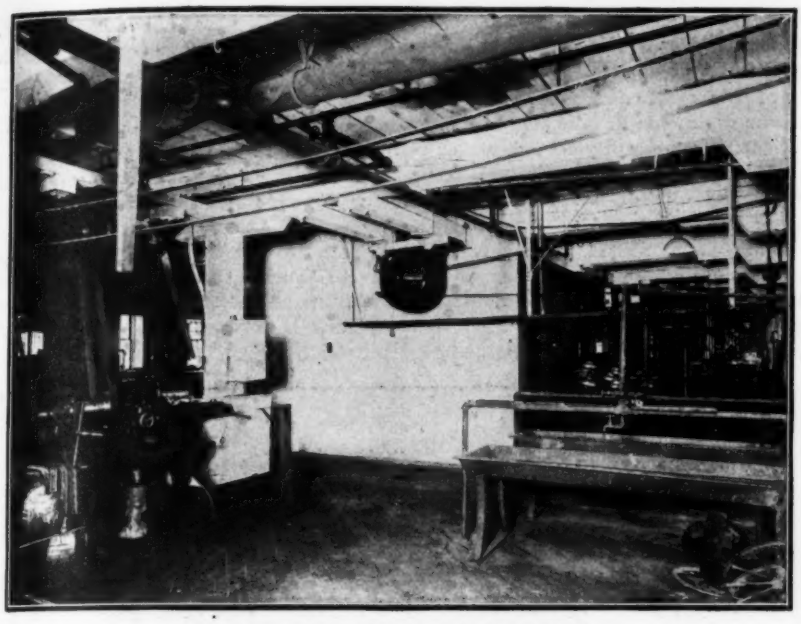
Many machine processes are required to finish the various parts and put them through the preliminary state. The principal parts include gears, roll-



Magnetic Separator in Cupola Room.



Six Facing Wheels Driven by 40-Horsepower Motor.

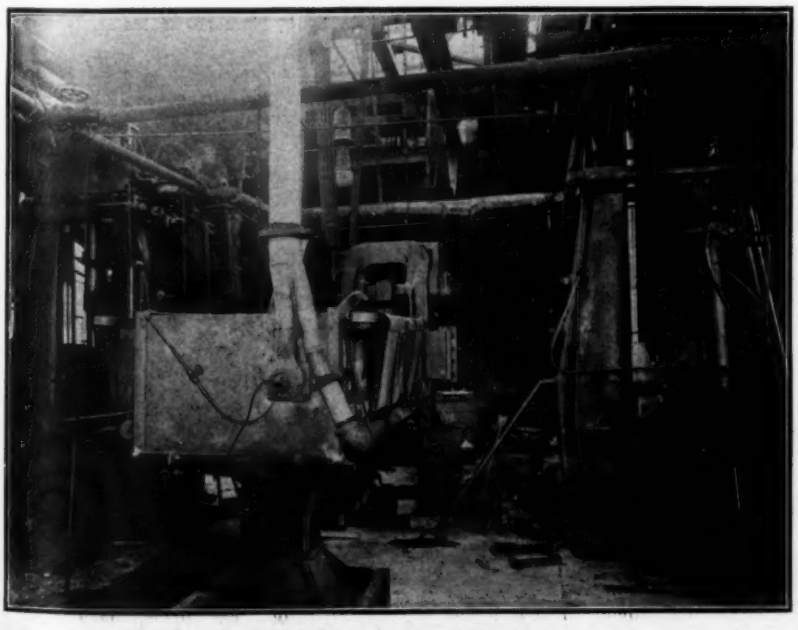


Fifty-Horsepower Motor in Drill Department.

er bearings, sprocket wheels, sprocket chains, nuts, bolts and many forged and cast parts. One of the principal features of the binder is the knotter, which ties the binder cord around the bundles of grain or corn. The work on this piece of mechanism requires the highest skill, and the use of jigs and special machinery so that thousands of duplicate parts can be turned out without any variation in quality or dimensions.

Reapers, in so far as the cutting mechanism is concerned, do not differ materially from the binder. This machine does not bind the grain, and is intended for small farms.

In the mower the cutting mechanism is similar to the last two machines. The hay tedder made by this company is for the purpose of turning over the hay as it lays on the ground, and is said to be especially valuable in a rainy season, for with it one can go into the hay field and toss the hay into light windrows where the air will circulate through it and dry it. It consists essentially of a number of oscillating forks which are mounted on wheels similar to a mower. As the horses draw the tedder the forks oscillate by means of mechanism, to which motion is imparted by the travel of the tedder. The hay rake is horse-drawn and is so arranged that by actuating a hand lever the rake can be lifted from the ground and the accumulation of hay dropped into piles. The corn binder performs the same function as the grain binder, with the exception that the bundles are tied and deposited in a vertical position. There are special departments for most of the machines, but there are many parts of the machines of all classes which are made in a single department, such as the bolt and nut departments.



Oil Burners and Drop Hammers.

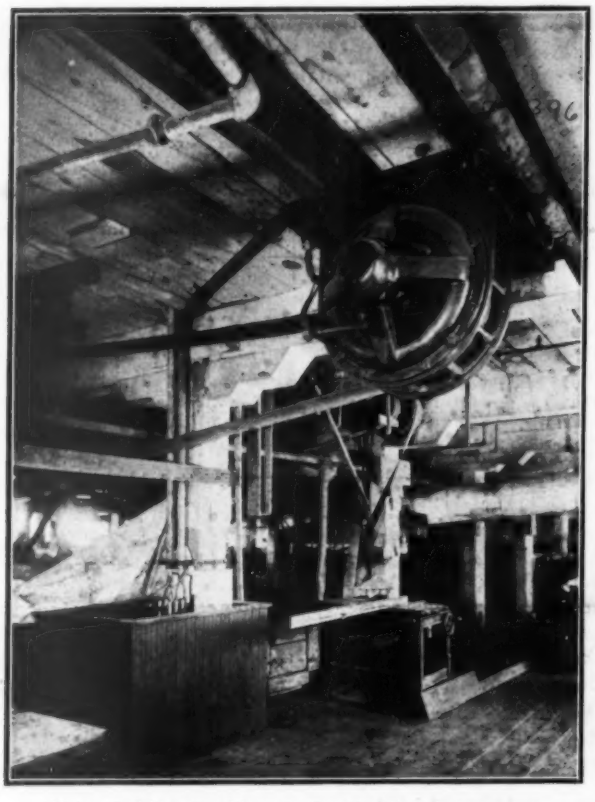
The Empire Gas & Electric Company's service enters through conduit from the street subway, and the three strands of the lead-covered cable connect to the lower terminals of three disconnecting switches the upper contacts of which connect to the service switchboard. Connection is also made from the service feeders to three disconnecting switches arranged in a row below the first set, the latter set of switches serving to disconnect three high-tension lightning arresters. The service switchboard consists of five enameled-slate panels with the necessary controlling and recording instruments, one panel of which is for controlling an auxiliary generator used for emergency service. Panel No. 1 controls the incoming service line, and is equipped with an oil switch, no-voltage relay, three ammeters, one for each phase, and an indicating wattmeter. Panel No. 2 is for controlling the auxiliary generator. Panel No. 3 is a totalizing panel, and is provided with two graphic recording watt meters and two watt-hour meters. One graphic recording meter and one watt-hour meter is for the central-station records and the duplicate instruments for the International Company's records. Panels 4 and 5 are power feeder panels. The records for the daily consumption of current from the graphic instruments are kept on file for determining the peak loads, which will be explained later.

Rates for energy are based on three factors: Flat rate for the connected motor load in horsepower, daily peak load, and sunset peak load. The day peak load obtains for the entire year and the daily peaks are averaged monthly for the basis of charges on this account. The working day is from 7 a. m. to 6 p. m., with a 50-minute recess at noon. There is also a Saturday half holiday. The daily peak-load charges are added to the flat-rate charges. From September 15 until March 15, inclusive, the sunset peak is figured, and is also added to the flat-rate charges. The sunset peak is the maximum demand during the time between sunset and closing time, which is 6 p. m., as previously stated.

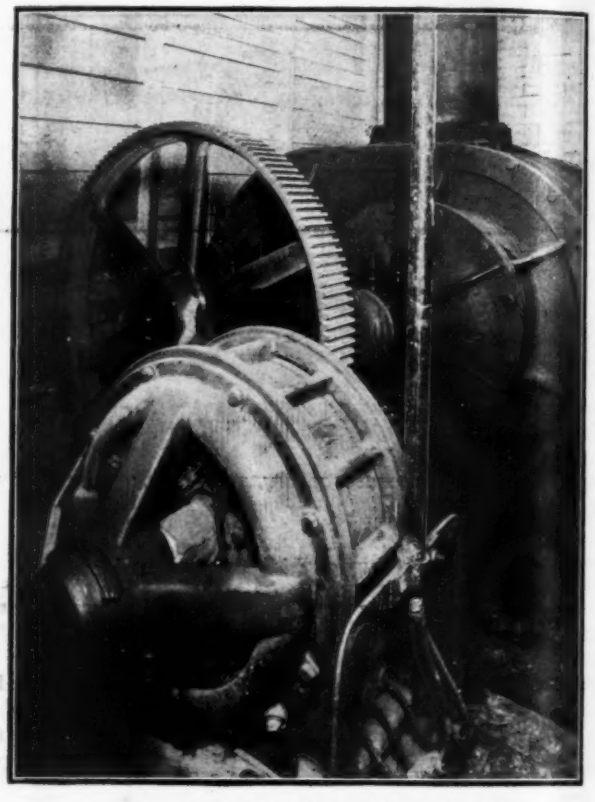
Construction work throughout the mills is conduit work for power feeders, with some open work for lighting circuits. Conduit is also used between the motors and starting compensators.

Motors are supported on heavy timber platforms or by I-beams laid across the roof girders. Particular attention has been paid to the motor pulley sizes and the speeds in an effort to standardize them as far as possible. In some cases a motor is not confined to driving the machines of one department, but may drive parts of two or more departments. This is for the purpose of dividing the grouping and shaft divisions in the most logical manner.

In every department there are several safety push-button switches for stopping the motor in case of accident; pressing the button operates the no-voltage release of the starting compensators. The chief electrician has devised an arrangement controlled by a solenoid on the starting compensator which automatically locks the latter when the safety button is pushed, and the starting lever cannot be operated until the button pushed is released. There are other arrangements for manually locking the starting compensator when the millwright is working about shafting or pulleys.



Motor Driving Machines in Box-Making Department.



Blower Driven by 50-Horsepower Motor.

Motor and Machinery Equipment.

Logically the experimental department is the keynote of the manufacturing plant, as here all machines are developed and new designs created. Not only this, but machinery and devices for improving the product and facilitating manufacturing are developed. When a new harvesting machine is designed or a new part of a machine developed samples are shipped to all parts of the country, and the machines are tried under all conditions—rank grain, down grain, rough land and wet land. Then the redesigning comes and a new lot of samples. This process is sometimes kept up for three, four, or even five years.

There is, of course, a drafting room, also a photographic department in connection with the experimental department. The machine equipment consists of a power hack saw, engine lathe, three small drill presses, one small engine lathe, forge, tool grinder, etc. The machines are group driven by a 10-horsepower, 220-volt induction motor of the squirrel-cage type. The motor operates at 1,200 revolutions per minute, and is equipped with an eight-inch pulley.

Next in order comes the pattern shop, where the patterns for all of the cast parts are made. The first patterns are wood, from which metal reproductions are made. It can be realized that for the many thousands of castings required for the machinery manufactured wood patterns would become so worn that the original dimensions would be destroyed. The machine enquipment consists of two eight-inch engine lathes, one 12-inch and one 14-inch engine lathe, three medium-sized drill presses, one surface planer, one band saw, one grind stone, one rip saw, and two wood lathes. The machines are group driven by a 10-horsepower, 220-volt, squirrel-cage motor with an eight-inch pulley. The motor operates at 1,200 revolutions per minute.

The cupola room, where the cupolas, three in number, are charged, contains some interesting applications. Draft for the cupolas is furnished by a high-pressure, 18-ounce, positive blower, driven by a 2,080-volt, internal-resistance induction motor operating at 900 revolutions per minute. This motor is geared to the fan with single reduction gears, having a ratio of 9.5 inches to 4 feet. A second motor of 35-horsepower, of the squirrel-cage type, drives a group of machines consisting of two tumblers for slag, two freight elevators, one 36-inch fan and one magnetic separator for separating the iron from the residue in slag. This latter machine consists of a cylindrical horizontal barrel slightly raised at one end, with collector rings mounted on an insulated collar at one end for conveying the energy to the electromagnets. The whole mechanism is revolved and the sand and residue passes through the machine and the iron retained.

In the foundry proper the flasks are handled by pneumatic lifts traveling on overhead trolleys. Adjoining the foundry there is a blast furnace for melting brass. The air is supplied by a blower driven by a three-horsepower slip-ring induction motor operating at 220 volts. The motor has a speed of

Motor Data—International Harvester Company (Osborne Works)

Total connected horsepower, 901.5. Total number of motors installed, 27.
Average kilowatt-hours per month per horsepower connected, 125.9.
The following is the monthly kilowatt-hour consumption for the 12 months.

Month	Kilowatt-Hours	Month	Kilowatt-Hours	Month	Kilowatt-Hours
March	144,100	July	127,590	November	142,125
April	135,200	August	84,835	December	161,225
May	164,800	September	146,350	January	82,560
June	139,075	October	158,975	February	84,700

Below are given the day and sunset peak loads for six days beginning January 4, 1915.

Date	Day peak-Kw.-hr.	Sunset peak-Kw.-hr.	Date	Day-peak-Kw.-hr.	Sunset peak-Kw.-hr.	Date	Day-peak-Kw.-hr.	Sunset peak-Kw.-hr.
Jan. 4	500	420	Jan. 6	505	475	Jan. 8	525	350
Jan. 5	490	480	Jan. 7	500	450	Jan. 9	175	Half Holiday

No.	H. P.	Kind of Drive.	Voltage	Type	Speed	Pulley Dimensions. Inches	Application.
1	10	Group	220	Squirrel-Cage	1200	8	Two drill presses, one grind stone, one wood lathe, one small wood planer, one small drill.
1	3	Belt	220	Slip-ring	1200	6	Blower for brass furnace.
1	50	Gears	2080	Internal-resistance	900	Gear	Positive blower 18-ounce, higher pressure type supplying three gray-iron cupolas.
1	35	Group	2080	Squirrel-Cage	900	13	Two tumblers for slag, two freight elevators, one 36-inch fan, one magnetic separator for separating iron from refuse in crushed slag.
1	15	Group	220	Squirrel-Cage	1200	8	One 8-spindle nut-tapping machine, one 12-spindle nut-tapping machine, seven automatic nut-tapping machines, one 8-spindle hand-tapping machine, three Pratt & Whitney automatic screw machines, two National-Acme automatic screw machines, one hand screw machine.
1	50	Group	2080	Internal-resistance	900	13	One annealing furnace, four cold-heading bolt machines, five cold-pressed nut machines, two cold rivet machines, one automatic trip bending machine, one automatic thread roller.
1	50	Group	2080	Internal-resistance	900	13	One cut-off machine, one small cut-off machine, one shears, three punch presses, two power hack saws, one freight elevator, six roll-thread threading machines, six old-style threading machines, two heavy threading machines, one 6-inch lathe, one drill press, one milling machine, one small milling machine, two bolt pointers, six small drill presses, eight 2-wheel emery grinders.
1	40	Group	2080	Internal-resistance	900	13	Eleven large tumblers, four small tumblers, one drill press.
1	25	Direct-Coupled	2080	Internal-resistance	720	..	Sixty-inch exhaust fan for removing dust from tumbling room.
1	75	Group	2080	Internal-resistance	720	18	Three bulldozers, one small bulldozer, one baby bulldozer, one bolt header, one Welderham No. 8 positive blower, one bolt machine, one tire welder, two eye benders, one power hammer.
2	30	Group	2080	Internal-resistance	900	12	One 60-inch fan for oil burners; three drop hammers; one power shears.
1	40	Group	2080	Internal-resistance	900	13	One 14-inch slotter; one 24-inch planer; two vertical milling machines; five grinders; six small twist drills; two 3-spindle drills; one 2-spindle drill; one small 2-spindle drill; six small engine lathes; one freight elevator.
1	10	Group	220	Squirrel-Cage	1200	..	Two 8-inch engine lathes; one 12-inch engine lathe; one 14-inch engine lathe; three medium size drill presses; one 22-inch surface planer; one band saw; one grind stone; one rip saw; two wood lathes.
1	40	Group	2080	Internal-resistance	900	8	Three 8-inch swing engine lathes; seven 10-inch swing engine lathes; one 12-inch swing engine lathe; one 18-inch swing engine lathe; one small horizontal boring mill; one 5½-inch slotter; four 24-inch shapers; one B. & S. 4A milling machine; one small milling machine; three turret lathes; one 5-foot planer; one 4-foot planer; two punch presses; one latch rod bender; one cotter machine; two wire straighteners.

No.	H. P.	Kind of Drive	Voltage	Type	Speed	Pulley Dimensions Inches	Application.
1	10	Group	220	Squirrel-Cage	1200	8	One power hack saw; one 10-inch engine lathe; three small drill presses; one 8-inch engine lathe; one 12-inch shaper; one small forge blower; one tool grinder; three drills.
1	30	Group	2080	Internal-resistance	900	13	Three freight elevators; one punch press; miscellaneous drills and special rivet machines.
1	75	Belt	2080	Squirrel-Cage	..	..	Motor-generator set.
1	30	Group	2080	Internal-resistance	900	13	Miscellaneous drills.
1	50	Group	2080	Internal-resistance	900	13	Miscellaneous machines including gang drills, turret lathes, key slotters, lathes, emery wheels, punches.
1	30	Belt	2080	Internal-resistance	900	..	No. 50 Sturtevant slow-speed exhaust fan for removing shavings and saw dust from box-making department.
1	30	..	2080	Internal-resistance	900	..	Twenty-four-inch wood planer in box-making department.
1	40	Group	2080	Internal-resistance	900	13	Six cut-off saws; two rip saws; one small wood planer.
1	75	Group	2080	Internal-resistance	720	16	Six facing wheels; twelve section grinders.
1	20	Group	2080	Squirrel-Cage	900	13	Two tempering machines; seven punch presses; one draw-temper fire; one freight elevator; three serrating machines; one multiple drill.
1	0.5	Belt	220	Squirrel-Cage	..	..	Ventilating fan, tempering room.
1	3	..	220	Squirrel-Cage	..	..	Hoist.
1	35	Belt	220	Slip-ring	..	..	Elevator.

1,200 revolutions per minute and is equipped with a six-inch pulley. For the repairing of flasks there is a flask room near the foundry equipped with two drill presses, one grind stone, one wood lathe, one small wood planer and a small drill. These machines are group driven by a 10-horsepower squirrel-cage induction motor with a voltage of 220. It operates at 1,200 revolutions per minute, has an eight-inch pulley.

From the foundry the castings are taken to the tumbling room where they are placed in tumblers and cleaned of the sand which adheres to them. The tumbler equipment consists of eleven large tumblers and four small tumblers. These are group driven by a 40-horsepower 2,080-volt internal-resistance induction motor equipped with a 13-inch pulley and operating at 900 revolutions per minute.

Work for all departments is performed in the blacksmith shop which has quite an extensive equipment of machinery. Here forgings are made and numerous parts are bent and shaped, tires are welded, large bolts are headed, large eye-bolts are made, etc. Three motors are used in this department, two of which are each rated at 30-horsepower and both are started with one starting compensator. The voltage of the motors is 2,080 and the speed 900 revolutions per minute. Each motor is equipped with a 12-inch pulley. These latter motors each drive one 60-inch fan for oil burners, three drop hammers and one power shear. The third motor is rated at 75-horsepower, is of the internal-resistance type operating at 720 revolutions per minute, and is provided with an 18-inch pulley. It group drives three bulldozers, one bolt header, one Welderham No. 8 positive blower for forges, one bolt machine, one tire welder, two eye benders and one power hammer.

The wire room has an equipment of one latch-rod bender, one cotter machine and two wire straighteners and is driven from a motor which also drives the machine shop and some miscellaneous machines. The wire for the cotters is first run through the wire straighteners and then through the cotter machine which is automatic in action. The latch-rod machine forms the hook in the end of the latch rod.

For the manufacture of bolts there are numbered among the machines, roll-threading machines, old-style threading machines and heavy threading machines. The roll-threading machines do not utilize a regular die as in the old-style machines but thread the bolt by a rolling process. The nut-tapping department is operated by a 15-horsepower, 220-volt squirrel-cage motor with an 18-inch pulley, operating at a speed of 1,200 revolutions per minute. It group drives multiple-spindle nut-tapping machines, automatic screw machines and hand screw machines.

In the bolt forge department the process is of more than ordinary interest. To see coils of the raw material passing rapidly through the machines and come out headed bolt blanks and to see cold metal pressed into nuts at a high rate of production makes a person realize what necessity for economical operation has been the means of developing. This department is driven by a 50-horsepower 2,080-volt internal-resistance motor with a 13-inch pulley and operates at 900 revolutions per minute. The group of machines driven by this motor comprise an annealing furnace, cold-heading bolt machines, five cold pressed nut machines, two cold rivet machines, one trip bending machine and one automatic thread roller.

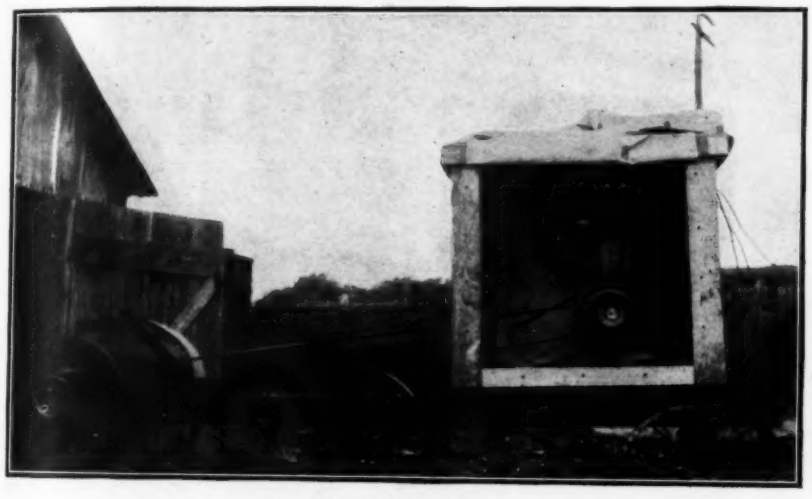
In the grinding room there is an equipment of twelve section grinders which are wet machines and have a stone approximately eight feet in diameter when new. These machines are used principally for the triangular sections which make up the cutter on binders, mowers, etc. In addition there are six facing wheels used for miscellaneous grinding. These machines are group driven by a 75-horsepower internal-resistance motor with a 16-inch pulley and operating at a speed of 720 revolutions per minute.

There are other departments having a miscellaneous equipment of machines which are devoted to various processes that are involved in nearly all of the machinery manufactured by the company. The miscellaneous motors with their applications are given on the accompanying data sheet.

Commercial Practice
Management, Rates, New Business

Uses Motor on Portable Wood Saw.

The accompanying illustration shows an interesting application of electricity. The two-horsepower, three-phase motor shown in the small shed drives a portable wood saw at the wood and coal yard of the Lacey Coal Company, Waco, Texas. The motor and saw are mounted on a wagon which can be pulled around over the large wood yard to any place desired. There are three poles set in the yard and by means of long service wires the motor can be connected where desired. Service is furnished by the Texas Power & Light Company.



Portable Motor-Driven Saw.

An Electric-Range Campaign That Paid.

An interesting as well as profitable electric-range campaign has recently been conducted by the Iowa Railway & Light Company of Toledo, Iowa. This company, with power lines extending through several of the smaller Iowa cities, decided to put more heating devices on its lines to maintain a day load. The Western Electric range was used as a means to this end.

A campaign was mapped out with three days at Tame, three days at Toledo and two days at Gladbrook—all in Iowa. Previous to the campaign a systematic series of ads, serving to stimulate an interest in electric ranges, were run in the daily papers of the above towns. A few days prior to the actual opening of the campaign, slides pertaining to it were run in the motion-picture houses, and a special personal letter was sent out.

The actual campaign was the culmination of the preparatory advertising; the people were given an opportunity to see in operation the electric stove they heard so much of in print. Practical demonstrations were held in each town in which the electric stove was made to bake bread and cakes, broil steak and chops and prepare entire meals. These demonstrations were almost continuous and were held where everybody could see them. Not only did the people see that the stoves were practical but they were shown the amount of current used for each operation, proving their economy under existing rates. The school boards of the towns received special invitations to visit these demonstrations and as a result, two complete domestic-science equipments were sold.

The campaign was a success not only from the standpoint of stoves actually sold but from an educational angle. Those people who did not buy electrical devices during the campaign have an idea as a result of it that electrical devices are worth while, and people with that idea are decidedly good sales prospects. When the Iowa Railway & Light Company conducts its next campaign, it will undoubtedly find that the actual sales will show an increase because of this effort.

Rural Extension at Madison.

Extension of electrical service to the farms surrounding Madison, Ind., has begun by the Madison Light & Railway Company. The first installation of the kind was represented by an extension of the line of the company a mile out from town to the farm of Joseph M. Cravens. He installed a 25-horsepower motor for threshing and heavier work, and a two-horsepower motor to operate house and dairy appliances. A similar equipment has been installed on the farm of A. R. Holcroft. Interest is general among the farmers of the section and it is predicted that two years will see electricity in general use.

Valuation of Milford Utility Property.

The town of Milford, Mass., several months ago selected a committee of seven leading citizens to investigate and report on the advisability of the town's acquiring the property and franchise of the Milford Electric Light & Power Company.

William Plattner, engineering expert, has made an exhaustive inspection of the plant and recently reported to the committee. The property values as scheduled by the company, and those found by Mr. Plattner are compared, as follows:

	Company Valuation	Engineer's Valuation
Electric plant	$16,691.66	$ 9,313.72
Overhead lines	58,851.64	23,798.37
Transformers	4,649.90	4,685.21
Meters	9,941.71	6,814.43
Office equipment, furniture	717.05	619.51
Electric fixtures, tools	437.02	217.09
Stock material	3,767.63	5,203.74
Stock in office	.....	1,078.94
Arc lamps	5,865.45	Incl. above
Totals	$100,920.06	$51,731.01

The estimated annual cost to the town of operating the present plant is $26,325. Mr. Plattner estimates the income as $37,996, of which $25,611 would be from commercial lighting service, $1,783 from public arcs, $7,420 from street incandescents and $2,909 from power.

The income as reported to the Electric Light Commission of Massachusetts for the year ended June 30, 1915, was: Commercial arcs and incandescents, $26,776; public arcs, $1,720; street incandescents, $7,198; power, $4,534.

According to the last published re-

port of the Commission, the company had capital stock outstanding of $40,000, bonds of $40,000, notes aggregating $30,800 and other minor items of liability. Operating expenses were: At station, $134; energy bought, $14,503; distribution, $3,167; management, $5,696; taxes, $2,121; incidentals, $556; total, $26,179. Its income from sale of electricity was $37,996, leaving a balance of $11,817. Dividends declared were $4,800; interest paid, $3,898; and balance in hand, $3,803.

The lighting company purchases energy from the Milford & Uxbridge Street Railway Company, in volume averaging about 425,000 kilowatt-hours a year. There are about 550 lighting and 60 power customers on the lines, with about 14,000 incandescent lamps and 65 motors connected. The total lighting load was 654 kilowatts, and the power load 146 kilowatts.

The population of territory served is 15,243.

New Lighting Installation in Waltham Employs Gas-Filled Lamps.

Improved street lighting at Waltham, Mass., was inaugurated on the evening of October 1. The installation consists of 84 600-candlepower Type C Mazda lamps in Novalux tops, mounted on Boulevard magnetite posts 18 feet high, of the same type as are installed by the Boston Edison Company on Huntington Avenue, Boston, and in Brookline.

The Waltham white-way lighting is on Main and Moody Streets, the two principal streets of the Watch City. Units are opposite one another, on about 125-foot centers. In addition, 51 600-candlepower lamps of the same type are installed on other streets, in various locations. These are contained in connected arc casings, suspended on mastarms.

There are also 75 100-candlepower Type C lamps on mastarms, under 20-inch reflectors. One hundred and sixty-two arcs are replaced by the above installation.

The remainder of the lighting equipment of Waltham consists of 623 tungsten units, of 40, 80 and 100 candlepower.

Several months ago the city government decided on an improved lighting installation for its streets, and Professor W. E. Wickenden was engaged to make a study and report on lighting conditions. An abstract of Professor Wickenden's report was published in THE ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for December 12, 1914.

The Edison Electric Illuminating Company furnishes street lighting to Waltham under a ten-year contract.

New Quarters of Haverhill Electric Company.

The Haverhill (Mass.) Electric Company, one of the several lighting properties under the management of Charles N. Tenney & Company, Boston, recently opened new offices on Merrimack Street. The building is a thoroughly renovated and remodeled Colonial structure, and the furnishings were chosen with a view to harmonious effect.

The first floor is given to a show room, and on the second floor are the bookkeeping headquarters, and the offices of the office and appliance managers. An elevator connects the two floors, and the lighting is semi-indirect, with bronze fixtures. The basement contains a stationary vacuum cleaner and an envelope-addressing machine, both motor driven. Here are also lockers for each employee, while on the third floor is a rest room for the women workers. The roof of the building is outlined with 200 incandescent lamps.

The two weeks, September 13-25, were devoted to an exhibition of domestic appliances. Among the devices shown were irons, electric ranges, washers, chafing dishes, toasters, percolators, etc., of various makes. Electrically prepared refreshments were served to all visitors, and music was discoursed by an electrically played piano.

A lady demonstrator was in attendance, and in conjunction with the exhibition canvassers from the Pettengill-Andrews Company, Boston, conducted a house to house campaign for the sale of appliances, with success.

New Office Building of Haverhill Electric Company.

Cambridge Company Offers to Sell Its Property.

The Cambridge (Mass.) Electric Light Company has signified to the Cambridge Board of Trade its willingness to sell its plant to the city providing a satisfactory determination of price be made before the question is submitted to the voters for action. The company says it is impossible to reduce present rates.

Simplified Rate Schedule of Springfield Company.

The practice of the United Electric Light Company, Springfield, Mass., in issuing a rate schedule that is based on the rated capacity of motors installed, at least lends itself to the clearer understanding of a central-station's power rates than if the price were measured by actual kilowatt-hours used according to a sliding scale. The plan is of some disadvantage to the central station, in that idle motors are reckoned in the count which enables the consumer to get as low a rate as the total rating of his motors calls

UNITED ELECTRIC LIGHT COMPANY

Rates for Electricity to be used for Power

1 to 5 H. P. 5 cents per kilowatt hour.
If more than 50 K. W hours per H P per month are used, the rate will be 4¢ per kilowatt hour

6 to 20 H. P. 4 cents per kilowatt hour.
If more than 50 K. W. hours per H. P per month are used, the rate will be 3½¢ per kilowatt hour.

21 to 35 H. P. 3½ cents per kilowatt hour.
If more than 50 K. W. hours per H. P. per month are used, the rate will be 3¢ per kilowatt hour.

36 to 50 H. P. 3 cents per kilowatt hour.
If more than 50 K. W. hour per H. P. per month are used, the rate will be 2½¢ per kilowatt hour.

51 to 75 H. P. 2½ cents per kilowatt hour.
If more than 50 K. W. hours per H. P. per month are used, the rate will be 2½¢ per kilowatt hour.

76 to 100 H. P. 2½ cents per kilowatt hour.
If more than 50 K. W. hours per H. P. per month are used, the rate will be 2½¢ per kilowatt hour.

101 to 250 H. P. 2¼ cents per kilowatt hour.
If more than 50 K. W. hours per H. P. per month are used, the rate will be 2¢ per kilowatt hour.

251 to 400 H. P. 2 cents per kilowatt hour.
If more than 50 K W. hours per H. P. per month are used, the rate will be 1¾¢ per kilowatt hour

401 to 550 H. P. 1¾ cents per kilowatt hour.
If more than 50 K. W. hours per H. P. per month are used, the rate will be 1¾¢ per kilowatt hour.

551 to 700 H. P. 1½ cents per kilowatt hour.
If more than 50 K. W. hours per H. P. per month are used, the rate will be 1½¢ per kilowatt hour.

Above 700 horse power the rate is 1 cent per kilowatt hour.

The above rates are based on rated capacity of motors installed and there is a minimum charge of fifteen (15) dollars per horse power per year.

Springfield Rate Card.

for, but this consideration is not important according to the company. The rate card issued by the United Company is of a size to fit inside a No. 10 commercial envelope without folding, and being long and narrow and printed on one side only, the card is readily tacked up in office or shop for ready reference on occasion. This feature is valuable, in that the inducement of lower rates for increased motor installation is ever before the factory manager.

The Springfield Company's power rates are among the lowest in the State, ranging from 5 cents to 1 cent a kilowatt-hour.

Electric Sign on Furniture Store.

A flashing electric sign recently installed on the front of a furniture store in a New England city, is remarkable for its construction and effectiveness. On the two faces of a metal drum, about 10 feet in diameter, bracketed to the front of the third story of the building, are installed, in each face, 72 10-watt lamps, those on one face being red and on the other green. The lamps are arranged on each face, in two outlines of a rocking chair, the axis of the rockers being coincident, but the upper part of one outlined pattern being at an angle of about 30 degrees from the other pattern, i. e., one tilting forward and the other backward from the normal upright position.

Each of the two groups of lights flashes alternately at about 10-second intervals, the effect being to produce the illusion of rocking backward and forward.

The daylight aspect of the sign is of a handsome mahogany rocking chair, the design being painted on the drum with upright portion midway between the lamp patterns.

Results of 30-Day Iron Campaign at Malden.

The Malden (Mass.) Electric Company, one of the lighting properties operated by Charles H. Tenney & Company, Boston, has recently closed a flat-iron campaign of one month's duration, with gratifying results. Twelve canvassers were provided with a specimen six-pound iron, with instructions on how to connect the apparatus and how to demonstrate its advantages.

A report each night specified number of irons sold, customers away, and irons already purchased. The returns showed that 2,481 of the number of housekeepers called on had already provided themselves with electric irons, and 1,146 were not at home when the solicitors called.

The proposition was, $2.50 cash, or $3 on time, with payments of 50 cents a month. A return postcard was sent in advance of the campaign to give opportunity to the recipient to evince interest. The company's autos and teams were placarded with attractive signs, and one electric truck carrying an illuminated sign paraded for a week. One evening an outdoor stereopticon show was given in Malden Square, consisting of the latest war pictures, and slides showing the process of manufacture of the iron.

The following were the net results of the campaign:

	Deferred payments	Cash
The salesmen sold	210	72
Collection agents sold	...	71
Other agents sold	55	10
Appliance department sold	19	59
By telephone and mail	88	9
Total placed in service	372	221
Number of cancellations		10
Receipts from 372 irons at $3		$1,116.00
Receipts from 221 irons at $2.50		552.50
Total		$1,668.50

Total kilowatts connected: 593 irons at 550 watts, 326.15.

Estimated yearly consumption, 60 kilowatt-hours per iron, 35,580.

Annual gross revenue at 10 cents a kilowatt-hour, $3,558.

New-Business Circular Brings Results.

Mention has been made in previous issues of the canvass which the Edison Electric Illuminating Company of Boston has been making in its territory to determine the extent of the use of electrical appliances and, more particularly, to compile records for an intensive comprehensive new-business campaign. During the canvass representatives have visited every customer, not only in Boston, but also in the 15 adjacent suburbs served by the company. Preceding the visit of the canvasser, the circular shown in the accompanying illustration, was sent to each customer and many inquiries were received and sales consumated simply on the strength of this advertisement.

THIS WILL INTEREST YOU

"ELECTRICITY For Everybody"

This is the Electric Age; Are You keeping up with it?

ELECTRICITY WILL DO YOUR HOUSEKEEPING

Have you an Electric Washing Machine, Electric Flat-Iron, Electric Vacuum Cleaner or Sweeper, Coffee Percolator, Toaster, Grill, Heating Pad, etc.? You should know all about these things.

MAKE YOUR STORE PAY MORE

Electricity is the Brightest Clerk you can have. It attracts business, welcomes customers, shows them your goods in the best light, runs the coffee mill, meat cutter, soda fountain shakers, fans, ventilators, cash carrier systems, cash registers, etc.

BOOM YOUR FACTORY

Electricity is a busy worker for you if you give it a chance—Clear, Steady Electric Light on the work and not in the worker's eyes, steady running motors close to each machine. Above all, Edison Service other takes no space, no up-keep, no coal worries, no dirt and ashes, and works only when you need it

RUN YOUR FARM AND DAIRY

Electricity takes the place of many hands. Does the work quicker, better and cheaper—Chops and Grinds the Fodder, Milks the Cows, Cools the Milk, Separates the Cream, Hatches the Chickens and Runs the Tool Shop.

EVERYWHERE ELECTRICITY IS THE SAVING WORKER

On the Farm, in Hamlet, Town or City—Electricity—Edison Service—will do your work Cheaper and Better than any other way.

Watch for the Edison Representative—He is coming to see you

Our lines cover 1442 miles of streets. An Edison Representative is coming to see you and will advise if we cannot reach you.

The Edison Electric Illuminating Company of Boston

General Offices, 39 Boylston Street Local Stores and Offices in 15 Towns

New-Business Circular.

Water Company to Discard Steam in Favor of Electric Pumping.

The Millbury (Mass.) Water Company is about to discard its steam pumping equipment and install an electric power system which will drive its new two-stage Goulds centrifugal pump having a capacity of 900 gallons a minute. A 100-horsepower Westinghouse motor operating at 1,800 revolutions per minute is to drive the pump.

Relative economies of electric drive have been demonstrated by water plants at Canton, Mass., East Providence, R. I., Wellesley, Mass., and other towns and cities in New England, where purchased power is used.

Original Window Display Attracts Attention.

An ingenious and effective window exhibit was recently installed in the show window of the Lowell Electric Light Corporation, Lowell, Mass., being made up principally of articles appropriate to the electric lighting business.

Ranged around the back of the window space was a semi-circular row of Mazda lamp boxes in the form of a fort. On top of this structure were placed three large cartridge fuses, each flanked on either side by a plug fuse, giving the effect of cannon in their embrasures.

The window ledge in front of the "fort" was overlaid with a billowy mass of cheesecloth to represent the ocean, and in the midst of it were placed several toy battleships.

Suspended by a cord from the ceiling, and hanging over the edge of the fort and "seacoast," was a toy aeroplane which was kept swinging, with revolving propeller, by the impulse of an oscillating electric fan located directly back of the fort.

On the front of the fan frame was attached a 300-watt type C lamp in a steel reflector. The lamp, turning with the fan, gave the effect of a searchlight sweeping the ocean, and lighting up the model battleships in turn.

The display was arranged by Whiting Geer, of the company's commercial department.

Electric Power in South Wales Collieries.

In the coal mines of the South Wales district of Great Britain, electricity is employed in 291 mines, on the surface to a total of 93,833 horsepower, and underground 100,444 horsepower. These figures are made up thus:

Surface.

Hoisting	16,373 horsepower
Ventilation	17,924 horsepower
Haulage	14,694 horsepower
Coal washing or screening	9,529 horsepower
Miscellaneous	35,314 horsepower

Underground.

Haulage	42,783 horsepower
Pumping	55,096 horsepower
Portable machinery	800 horsepower
Miscellaneous	1,765 horsepower

In these collieries there are 23,066 electric safety lamps in use. Of these, 16,057 are of the C. E. A. G. type (15,426 with magnetic locking and 631 with lead-rivet locking); 5,753 are of the Oldham type (5,369 with magnetic locking). The balance of the total are of Bristol, Float, Gray-Sussmann, Wolf and Varta types. In regard to shot-firing, out of 4,174,106 shots fired, 2,918,873 were fired electrically, 985,759 by fuse, and 269,475 by squibs. The miss-fires worked out as follows for these three classes: With electricity, 3,241; with fuse, 1,341; otherwise, 195.

Increased Power Needs of Youngstown District.

Ground has been broken for the erection of an addition by the Mahoning & Shenango Railway & Light Company, the operating subsidiary of Republic Railway & Light Company, to its central generating station at Lowellville, O.

The installation of the new equipment, which, with the power house, cost about $750,000, will add 20,000 horsepower to its capacity. The increase in generating capacity was rendered necessary by the growth of traffic on the various interurban lines served with power from this station, as well as by the heavy demand for current for power by the iron and steel and allied industries in the Youngstown and Sharon districts.

Special Sales in Boston.

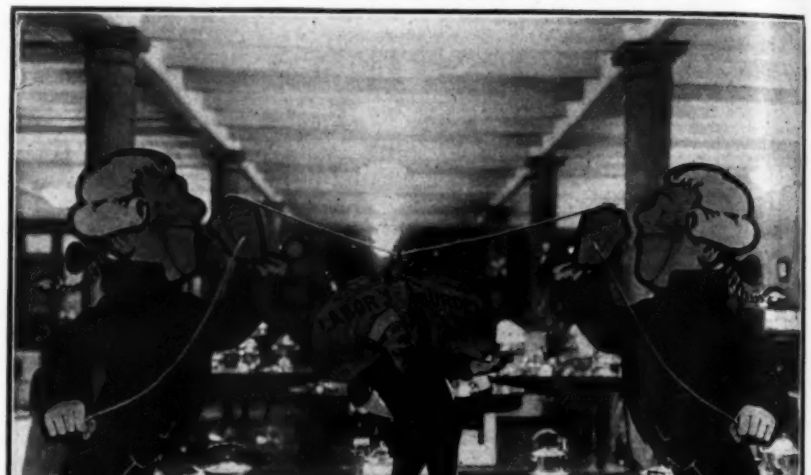
The Boston Edison Company is conducting a sale of attractive table lamps at prices ranging from $5 to $27. The Duntley pneumatic cleaner and the "Brilliant" vacuum cleaner are also being featured. The latter is being sold at $19.00. One unit is offered to be sold at a discount of $1, each day after being offered.

New Street Lighting in Jeffersonville.

Change from the old system of arc lighting in Jeffersonville, Ind., to Mazda nitrogen series lamps, has been effected. Sunday, October 10, was selected for the change and gangs of men spent the day removing the old arc lamps and replacing them with the incandescent lamps, and that evening members of the city council threw the switches to illuminate the new system with a good deal of ceremony. About three hundred lamps are required under the new system. They are of three sizes, 400 candlepower, 250 candlepower and 80 candlepower. The contract for the new service was made last May. Some of the old lamps had been in continual use for over fifteen years.

Prize Window Display of New York Edison Company.

The accompanying illustration will give some idea of the results of the window display contest conducted by the New York Edison Company for an appropriate Labor Day design. The first prize was won by A. F. Westervelt of the lighting inspection bureau and the second prize went to Charles Langford of the distribution department.



Prize Window Display of New York Edison Company.

It is the custom of the company to conduct contests for special window displays several times each year offering an award in gold for each accepted design.

Electrification Again Advocated at Boston.

Electrification of all railroad lines within the metropolitan area of Boston, Mass., and the construction of a subway to connect the north with the south terminal, were advocated at a hearing held October 15 by the Terminal Commission now considering improvements in railroad freight and passenger handling in Boston.

Electrical Construction

BUSINESS HINTS FOR DEALER AND CONTRACTOR.

By G. D. Crain, Jr.

Handling the Architect.

Soliciting the architects may be a very expensive and futile proposition; or it may be a profitable and worthwhile expenditure of effort. The result, from the standpoint of the electrical contractor will be determined almost entirely by the character of the solicitation.

Calling on architects is not a job for a "cheap man." It is not the sort of work for a boy or any untrained employee to attempt. If a contractor sends out the wrong sort of representative to solicit the architects, he is simply throwing his money at the little birds. On the other hand, if he has as a solicitor someone who can not only ask business of the architects, but can actually tell them the things they want to know, he is sure to get a lot of business out of it. In fact, business will be created.

Lots of the so-called solicitors enter an architect's office, stand around on one foot until they can get an audience with the head of the office, and then ask hopefully, "Anything doing today?" The architect, ninety-nine times out of a hundred, will reply in the negative. That sort of work is absolutely n. g. and is productive only to the extent that it provides a job for the solicitor.

But when an electrical contractor or his representative, fully up-to-the-minute on electrical wiring, fixture and installation problems, goes into an architect's office, he doesn't go there merely to get, but to give. He can give the architect information that he may be in need of, and the chances are that he is "talking" something that he wants the architect to specify in his next job.

For instance, suppose in addition to being a contractor, he is a dealer, and has the exclusive agency for a new type of indirect lighting fixture. Then he will want to explain to the architect the special advantage of using that particular fixture, and will incidentally learn, if he is a wise solicitor, the jobs which the architect has in view in which it may possibly be used. This sort of solicitation kills two birds with one stone, since it develops information about new building work, and at the same time gives the specialty a boost in connection with it.

Some architects of the lofty, I-know-it-all type, are difficult to approach, and hard to do anything with. Others, realizing their own limitations, and appreciating the fact that electrical installations are a field in themselves, and require expert treatment, are glad to have intelligent advice on the subject. The solicitor can soon determine where his efforts can best be expended, and direct himself accordingly.

The Window-Trim Problem.

"Oh, I don't know anything about trimming a window," objected a hustling, successful, dealer-contractor, who has been carrying a very fair stock of electrical merchandise of late. "My work has been on the outside."

This was said in response to the suggestion that he give more attention to the display of goods in the window. He seemed to think that because he did not understand the intricacies of display to the extent shown by the window men of the big department stores, drawing down as much as $100 a week for their services along this line, it was absolutely useless for him to attempt to display goods in his window.

It was pointed out to him, however, that trimming a window effectively does not necessarily involve sleight of hand, and that, considering the large amount of splendid material which the manufacturers of electrical goods now furnish, the veriest tyro can make a creditable display. He finally decided to push his window displays a little more, and turned this proposition over to a youngster in the store, who was familiar with the stock, and who was informed as to the sort of goods which were selling most readily.

This lad then began to take charge of the advertising literature, much of which came with shipments of goods, and much of which had been thrown away with hardly a glance. He put cards and cut-outs in the window, stacked "dummy" cartons bearing the name of advertised goods on the counters, and wherever he saw a chance to use the stuff he did so.

In a few weeks, by dint of serious effort in the direction of displaying the goods attractively in the window, coupled with suggestions from salesmen of the manufacturers who happened to come into the store, this youngster was putting on displays which made people stop and look, and then come in and buy. And, quite naturally the more effective the displays came, the harder he worked on them.

The dealer who is busy with something else, and hasn't the time to give to showing goods in the window, ought to put this end of the business in the hands of some bright young man connected with the store. It will give the latter an outlet for some of his superfluous energy, and it will make sales for the store, as sure as you are a foot high.

They Don't Sell Themselves.

Electrical merchandise is just about as attractive and salable as any sort of goods in any kind of store in the field.

But they don't sell themselves.

Being novelties to a large extent, demonstration is required and clever salesmanship on the floor is needed, even after the customer has been brought inside from the street.

Merely having a store where electrical goods are carried in stock does not insure getting enough volume to support the store and its necessary expenses and leave a profit for the dealer.

Therefore, if you are thinking of establishing a retail store apart from your principal place of business, be sure that you have organized this feature of the business correctly, and that you have arranged for the right kind of supervision and management.

A big contractor-dealer, who has always given the merchandising end of his business careful thought, and who has appreciated its possibilities, established a store in the downtown district, some distance away from his headquarters, several years ago. The store was opened during the holiday season, and partly on this account and partly because special advertising was undertaken to call attention to the opening, sales during that season were excellent. After that, however, things began to drag, and the head of the enterprise realized for the first time that retail sales are not made auto-

matically, but as the result of well directed efforts along a number of lines.

Seeing that he could not be in two places at once, and that an efficient man to supervise the store and take general charge of it was needed, he began to look around for such a man, but had difficulty in getting the right sort of manager at the figure he felt he could afford to pay. So the store got rather indifferent handling for some time, and only during special seasons of the year, when the goods were especially suitable for gifts, did the business prove satisfactory. At last the electrical man, thoroughly disgusted with his experiment, closed up the retail store, put the stock back at the main establishment, which was out of the retail district, and gave up his effort to develop that end of the business in the ambitious way he had planned.

The only moral, of course, is to figure that selling the goods is going to be a sufficiently hard job to require the services of a high-grade manager; to select him accordingly, and to pay him enough to make it worth his while to work to the limit to sell the goods speedily.

Sales of electrical goods will support a retail store; but the store must be properly managed, just like any other retail establishment. The goods won't sell themselves.

Deal with One Bonding Company.

On practically all official work, no matter how small, the contractor is required to give bond. The expense of this bond, by the way, should be figured in advance as part of the cost of the job. It is a good plan to deal with one good bonding company exclusively, as this will save a lot of trouble. The surety companies require complete and elaborate information about the business of the contractor, as this class of bonds is considered more hazardous, from an underwriting standpoint, than others, and it is a big convenience to have this statement on record with the company which has been selected, so that it will have to be given again only at rare intervals. The contractor who uses a number of companies is compelled to make out statements to each one, and multiplies the work which is involved in that connection, as the list of questions which must be answered is very long. Besides, it will strengthen his credit to have his bond invariably presented by the same company, which is obviously most familiar with his financial condition.

T. L. Dixon opened an electric store several months ago at 622 East Michigan Avenue, Lansing, Mich. Mr. Dixon carries a line of electrical supplies and also conducts a contracting business at the above address.

Co-operation Between Contractors and Central Stations.

The October meeting of the Lehigh Valley Light & Power Company Section of the National Electric Light Association was held at Allentown, Pa., with Chairman Taylor T. Fogel presiding. After the customary business meeting, Abbot S. Weibel, president of the Lehigh Electric Company, one of the largest contracting firms in eastern Pennsylvania, and also president of the Allentown Rotary Club, gave an exceedingly interesting talk covering the problems encountered by the electrical contractor.

He said in part: "The first thing to be considered is the pleasing of the customer both in a personal way and with a satisfactory installation, for a satisfied customer is the best advertisement for both the contractor and the central-station company. The co-operation of the two parties is absolutely necessary. A correct understanding by the contractors of the rules and regulations of the electric service company is imperative in order to render correct lighting and power service to the public, while boosting and advertising electric service and appliances is advantageous to both the contractor and the lighting company."

Mr. Weibel concluded his talk by giving a few examples where the electrical contractor and his employees get in more personal touch with the customer than the solicitors of the central-station company and consequently can do much to further the use of electric service.

It was suggested that the contractors and the representatives of the light and power company arrange to have an occasional "get-together" meeting to promote a better spirit of co-operation, to the mutual advantage of both, for a greater development of the electrical business. The suggestion was very well received by all concerned and active steps will soon be taken to carry out this plan in Allentown.

Examinations in Massachusetts.

Examinations of electrical journeymen and masters in Massachusetts are being held from time to time at Boston. The fourth examination occurred September 29, when 112 journeymen and 15 masters were in attendance. Of these 12 failed to pass.

Questions were based on the National Electrical Code, and simple diagrams were required to indicate the applicants' knowledge of wiring rules. Men who failed to pass at the first and second examinations, held in August, reappeared at the later tests, and in most cases succeeded in passing this time.

New Electrical Code for New York.

This Code is Chapter 9 of the Code of Ordinances of the City of New York. It was enacted by the Board of Aldermen and became effective July 16, 1915. The following are some of the essential provisions of the Code:

(1) No electric work may be done except by holders of (*a*) a license, (*b*) a special license, or (*c*) a special permit.

(*a*) A license is an authorization to engage generally in the business of installing, altering or repairing electric work.

(*b*) A special license is an authorization to install, alter or repair electric work in a certain specified building.

(*c*) A special permit is an authorization to install, alter or repair electric work constituting a single job.

(2) To secure a license or a special license the applicant must first obtain the favorable recommendation of the License Board. Blank forms of application will be furnished upon request. Holders of licenses or special licenses must file an application for a certificate of inspection before beginning work. A person desiring a special permit must apply for and obtain the same before commencing the work contemplated; at the same time he must file an application for a certificate of inspection on such work.

(3) Fees. "There shall be charged and collected by the commissioner a fee of $10 for each license issued under the provisions of this chapter and thereafter an annual fee of $5 for each renewal of such license and a fee of $1 for each special license or special permit so issued."

(4) Modification, suspension or revocation of special permits and licenses. "The commissioner may at any time by an order in writing, for good cause shown, modify, suspend or revoke any special permit issued pursuant to this chapter, and in like manner, but upon recommendation of the License Board, he may modify, suspend or revoke any license similarly issued."

(5) Electric current may not be supplied to any installation in advance of a certificate of inspection either temporary or final.

(6) The commissioner has power to modify, suspend or revoke at any time a certificate of inspection.

(7) The commissioner has power to order the correction of electrical defects and to disconnect and seal the supply wires and apparatus if his orders are not complied with.

(8) Articles 2, 3, 4, 5 and 6 of the Code contain the technical requirements. These are substantially those under which the Department has been conducting inspections for the past two years, except that Article 3—outside

work—has been greatly abbreviated by omitting all reference to pole lines. They correspond to the rules of the National Electrical Code, edition of 1913.

(9) The penalty for violation of the ordinance is as follows:

"Any person who shall violate any of the provisions of this chapter, or fail to comply with any requirement thereof, or who shall violate or fail to comply with any order or regulation of the commissioner made thereunder, or who, being the holder of a special permit, shall install, alter or repair any electric wiring or appliance for light, heat or power, in violation of this chapter, shall, for each and every such violation or non-compliance forfeit and pay a penalty in the sum of $50."

(10) The ordinance contemplates that only authorized persons shall alter or repair electric wiring or appliances for light, heat or power, with the exception of fuse renewals, lamp renewals "and portable devices which together with their cables and attachments have been approved for connection to appropriate parts of the permanent electrical equipment."

(11) Since one of the purposes of the ordinance is to fix responsibility for electric work, the journeyman electrician, or any person working under the supervision of the holder of an authorization (license, special license or special permit) is not required to be the holder of an authorization of his own.

(12) The License Board, from which will emanate the recommendations for the issuance of licenses and special licenses, meets weekly. This Board has established the following rules:

(*a*) An applicant for a license or a special license shall be required to submit with his application a sworn statement which shall give the age of the applicant, if an individual, shall inform the Board of the period of time such applicant shall have been in business as a master or employing electrician, and shall give a list of at least twelve complete equipments for electric light or power which he has installed.

The Board reserves the right further to examine such applicant, either orally or in writing, as to his fitness and qualifications.

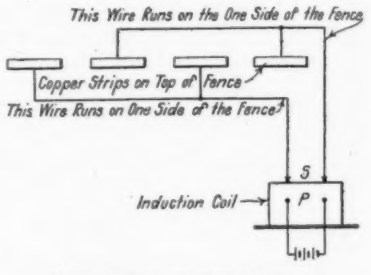
(*b*) Applicants unable to comply with the above conditions shall be required by the Board to submit to a written examination.

(*c*) Applications may be made in the name of an individual, a corporation or a co-partnership. In the case of a corporation or a co-partnership, the applicant shall state the name, age and official position (with such corporation or such co-partnership) of its representative who will submit to examination.

(*d*) Where two or more buildings are under one ownership or one management, the person employed by such owner or by such management to supervise the installation, alteration or repair of electric wiring or appliances in such buildings shall be licensed; or else, the electrician in each building must hold a special license.

Cat Silencer.

Until the present time, I have been pestered by cats howling at nights on the back fence and keeping me awake. To avoid this, take a number of strips of thin copper as wide as the top of the fence, about one inch, and six inches long. Tack these on the top of the fence about three inches apart, then tap wires from every one, 1, 3, 5, etc., going on one side, and 2, 4, 6, etc., going on the other side; connecting all to two wires, as shown in illustration, running to spark coil. When a cat steps from one to the other it


This Wire Runs on the One Side of the Fence
Copper Strips on Top of Fence
This Wire Runs on One Side of the Fence
S
Induction Coil
P

Connections of Cat Silencer.

closes the spark gap and gets a shock. I now sleep in peace.

The coil is working all night but is ready at any time. The coil can be placed in the cellar so that in case of rain it will not be damaged.

R. R. Lautenschlager.

Portland Code.

The city of Portland, Ore., has recently passed a new electrical code which is novel in a number of particulars. The code has been published in loose-leaf form so that when it is amended the old edition can be brought up to date by simply inserting a few new leaves. It also permits of certain sections of the code, which may be in more constant use than others, being segregated and carried in the pocket, as the size of page chosen is such as to permit this.

The code provides for a Board of Appeal, a method which has already been tried in connection with the general building code and found very satisfactory.

The code follows in the main the requirements of the National Electrical Code, but there are a few items in which changes have been made. The direct regulation of heating appliances, such as irons, toasters and percolators, to prevent overloading of circuits, is not attempted, but this is done indirectly by requiring wiring to have a capacity which is based on the floor area and varies with the occupancy of the building.

Among the Contractors.

The manager of the West Coast Engineering Company, Portland, Ore., R. G. Littler, reports several nice electrical construction contracts on hand at this time. He is just completing the 1,500-horsepower installation at the new plant of the Western Cooperage Company, St. John, Ore., which plant was also completely wired for lighting as well as for power. The company has also completed the re-wiring of the Columbia Flour Mills for both lighting and power, and installed the wiring systems for lighting and power in the Stettler Paper Box Company's new factory, which included the installation of a 50-kilowatt three-phase generator, switchboard and engine. Contracts are on hand for a store building for the Lewis Investment Company and for the $30,000 residence for Captain Voorhies, of Golf Park. The re-wiring of the six-story building of the Hughes Investment Company was also completed recently. The company has the contract for the complete electrical installation in the new First National Bank Building, now in course of construction, which Mr. Littler states will be one of the most completely equipped banks, electrically, in the country.

The Erner & Hopkins Company, Columbus, O., has closed contracts for electrical work for the following improvements in that city: Wiring for the new Marietta Paint & Color Company factory and building; wiring for the Budd Dairy Company plant, which among other features will have 140 lamps about the outside coping; wiring for the Peters seven-story office building; wiring for the Columbus Packing Company's new six-story addition; wiring and other work for the new Scioto Country Club; wiring for St. Leo's Church; the electrical equipment for the new lighting plant of the Ohio Masonic Home at Springfield, including motors, generators, etc.

Contract has been secured by the McKeever Electric Company for what is considered about the last word in modern electrical equipment for a country school house. It is located near West Alexandria, O., and the electrical work will run to $4,000, including generators, vacuum-cleaning installation and wiring. A $2,500 contract for the State Hospital at Athens, O., provides for a new lighting system, with 55 outlaying stations.

Public Service Commissions

Conducted by William J. Norton

ARIZONA.

The Southside Gas & Electric Company. The Commission has issued an order reducing the electric rates of the Southside Gas & Electric Company for lighting and power service in Mesa, Tempe and Chandler. The new rates are effective as of November 15. The rates prescribed by the Commission are: 14 cents per kilowatt-hour for the first 10 kilowatt-hours consumed per month, 13 cents for from 11 to 100 kilowatt-hours, and 3 cents for all excess. The minimum charge for lighting is $1.00 per month per meter. The minimum charge for power for installations of one horsepower or less is $1.00 per month, and for installations of more than one horsepower, $1.00 per month per horsepower.

CALIFORNIA.

Report on Development of Public Utilities. The Railroad Commission has rendered a report outlining the public utility development work carried on in the state of California since the Commission assumed its jurisdiction over stocks and bonds in March, 1912. The report covers a period from that date to September, 1915, and states that during this period stocks, bonds, notes and certificates have been authorized by the Commission for the public utilities of the state amounting to $466,000,000. Of this amount $175,000,000 has been used to pay maturing debts, and $248,000,000 for new construction, developments of existing utilities, and new ventures.

The Pacific Gas & Electric Company was authorized to acquire, and the trustees in liquidation of the West Sacramento Electric Company to transfer, all the property formerly owned by the West Sacramento Company.

IDAHO.

Special Power Rates. As the result of informal conference between the Idaho power companies and the consumers, held before the Public Utilities Commission, an agreement has been reached fixing new and reduced rates for power for irrigation purposes.

Some objection was made at the hearing to the manner in which it was conducted, in that an attempt was being made to determine what the farmer was able to pay, rather than what would afford a fair return to the company. Commissioner Ramstedt explained that the manner in which they were proceeding was the only way of reaching a satisfactory agreement, and that the Commission did not have sufficient funds to make a valuation and complete investigation of the properties involved.

The new schedule, which will apply to the service for 1915 and two years thereafter, provides a demand charge of $12 a year per horsepower, payable in equal installments during the months the service is used, plus one-half cent per kilowatt-hour for all energy consumed per month. A guaranteed minimum payment is required of $15 per horsepower per month. In addition to these terms, the following quantity discounts are applicable to the new schedule: The first $100 of the monthly bill is net; the second calls for a five-per-cent discount; the third for a 10-per-cent discount; the fourth a 15-per-cent discount, and all over $400 a 20-per-cent discount.

On installations of 100 horsepower or over, the quantity discounts applicable are 10 per cent on the first $1,000 of the monthly bill, 20 per cent on the second thousand, and a discount of 40 per cent on all payments over $2,000.

NEW YORK—First District.

New York Edison Company. The First District Commission has issued an order addressed to the New York Edison Company and the United Electric Light & Power Company, which provides that after January 1 these companies shall make free renewals of lamps to their customers, supplying tungsten lamps of 50 watts and above. The smaller-size tungstens are to be paid for by the customers at a price not exceeding the actual renewal cost of such lamps. It was a former practice of the companies in making renewals to furnish Gem, or carbon-filament lamps. After May 1, 1915, by order of the Commission, the companies reduced their price for current from 10 cents to 8 cents per kilowatt-hour, and allowed the renewal of tungsten lamps when the customer paid an additional half cent per kilowatt-hour for current. The present order cuts out this extra half cent per kilowatt-hour.

The order also provides that the companies shall not refuse to supply current to any applicant on the ground that the applicant is either the owner or operator of a private plant or customer thereof, provided he is not selling current to others outside of his own premises.

After January 1, 1916, the companies shall determine the amount of current supplied by means of a master meter or meters installed on the premises of the customer.

The majority opinion was written by Commissioner Williams. Commissioner Hayward also submitted an opinion in the case, holding that the companies should be required to furnish tungsten lamps of 25 watts without charge.

WISCONSIN.

Standards of Electrical Construction and Operation. Tentative rules have been prepared and submitted to all interested parties throughout the state applying to methods of construction and operation to meet the requirements of public safety and to prevent service interference between public utilities. These rules will be the basis of a joint hearing before the Railroad Commission and Industrial Commission of Wisconsin, to be held at Madison on October 22 and 23.

Annual Edition of List of Radio Stations.

The United States Bureau of Navigation has in the hands of the Public Printer its annual edition of the "List of Radio Stations of the United States," containing a list of 5,073 stations. The table here given shows the number of land, ship, special land, and amateur stations in this publication, as compared with that of 1914:

Classes of stations.	1914.	1915.	Increase.
Government and commercial land stations	189	224	35
Government and commercial ship stations	895	895	0
Special land stations.	54	118	64
General and restricted amateur stations.....	2,796	3,836	1,040
Total	3,934	5,073	1,139

The appendix to this list contains several articles of interest to radio operators. The books, which will be available by November 1, may be procured from the Superintendent of Documents, Washington, D. C., at 15 cents per copy.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 311.—Simple Rate System.—Has any system of rates for residence customers of a central station ever been devised which, though based on actual or assumed maximum demand and including primary and secondary rates for, say, 30 hours' use of this demand, can be fully explained to any customer without using the words "30 hours' use," "demand," "maximum demand," or even "kilowatt-hours"? If such a simple system is as yet too ideal, what is the nearest approach thereto that has been attained?—W. H. T., Ann Arbor, Mich.

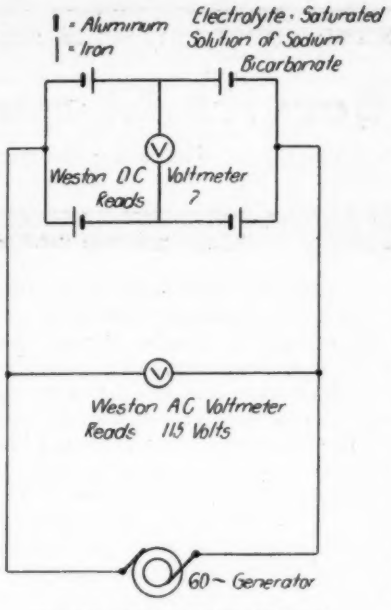
No. 313.—Trouble Near Wireless Stations.—Why is it that in residences in close proximity to wireless stations watt-hour meters frequently burn out and lamps and lamp sockets become short-circuited? Is there any danger to life or from fire? How do central-station companies overcome the difficulty?—C. F., Chicago, Ill.

No. 314.—Talking Signs.—What means are used in electric "talking" or word-spelling signs to prevent injurious arcing at the contacts where the current is continually changed from lamp to lamp?—A. F. B., New York, N. Y.

No. 315.—Motor-Driven Motion-Picture Machines.—About what percentage of our large cities having over 100,000 population permit the use of motor-driven motion-picture machines?—S. P. L., Topeka, Kans.

Answers.

No. 304.—Voltages With Electrolytic Rectifier.—In the diagram given of a Nodon valve (electrolytic rectifier) I find by actual test that the direct-current voltmeter reads higher than the alternating-current voltmeter. Theoretically, as I reason it, the alternating-current voltmeter should read approximately 0.7 of the maximum ordinate of the sine curve of E. M. F. and the direct-current voltmeter should read approximately 0.6 of the maximum ordinate of the same sine curve of E. M. F. Please explain why the direct-current voltmeter reads higher than the alternating-current voltmeter. To give a concrete example, suppose the alternating-current voltage applied to a Nodon valve, as shown in the diagram, be 115 volts, what will the rectifier direct-current voltage be?—A. G., Fort Monroe, Va.


= Aluminum
= Iron
Electrolyte - Saturated Solution of Sodium Bicarbonate
Weston DC Voltmeter Reads 7
Weston AC Voltmeter Reads 115 Volts
60~ Generator

No. 304.—Nodon-Valve Voltages.

Although it may seem peculiar, the fact is that on open circuit, that is, with no direct-current load, the direct-current voltage of an electrolytic rectifier of the Nodon-valve type is higher than the alternating-current voltage applied. Undoubtedly this is due to the direct-current meter registering practically the maximum voltage value of the alternating-current sine wave (which equals 1.414×110 volts). Data obtained on a test of an electrolytic rectifier made by one of the leading testing laboratories of the country bear this out. It was of the four-cell type as indicated in the diagram and used sodium phosphate. With the electrolyte at room temperature and 110 volts, 60 cycles applied, the direct-current voltmeter read 141 volts when there was no load on the direct-current side. With the electrolyte heated to about 190 degrees Fahrenheit, repetition of the test showed 125 volts direct current corresponding to 110 volts alternating current. On applying load, the direct-current voltage dropped to between 90 and 80 volts, depending on the amount of direct-current load; this was true both cold and hot. The efficiency of the loaded cell was about 40 to 45 per cent when cold and 23 to 26 per cent when hot.

The excess of the open-circuit direct-current voltage is probably helped by the inertia of the direct-current voltmeter, as well as the condenser effect of the rectifier. This capacity effect tends to cause the voltage to pile up, so to speak, and this causes the direct-current voltmeter to read much higher than the effective alternating-current voltage value of the circuit.—H. W. S., New York, N. Y.

No. 309.—Automatic Cutout.—It is desired to keep an electric water heater taking 550 watts in circuit as continuously as possible. A few other devices and lamps are also on this circuit, but are turned on for short intervals only. Is it possible to devise some automatic means for temporarily cutting out the heater while the other load exceeds one ampere? The device must reconnect the heater as soon as the other load is cut off or reduced to less than one ampere.—V. B., Milwaukee, Wis.

The arrangement proposed is quite feasible by simply connecting a current relay in the circuit which acts on a circuit-breaker in the circuit of the water heater. Such relay can very likely be bought from stock of one of the supply companies. It is to be connected to the switch which opens or closes the current for the water heater corresponding to the current needed in the other circuit. In the case in question the relay should be set for one ampere when it opens the switch and breaks the current. As soon as the current falls below one ampere, the relay causes the switch to be closed again. It would be sufficient to use a single-pole switch only, as there is probably a main switch for the whole installation. One way of working would be that the switch is kept closed permanently by a spring, the force of which is overcome by the relay as soon as the current in the other circuit exceeds one ampere.—H. A., Pittsburgh, Pa.

Since the supply voltage is not mentioned it is presumed to be 110 volts.

The simplest way to accomplish the desired result would be to design a coil or solenoid which is placed in series with the smaller load, namely, the one-ampere load. This solenoid controls a plunger, to the bottom of the shaft of which is affixed a copper or brass disc. Two stationary contacts are fastened to the slab or base to which the solenoid is fastened; one of these contacts is connected to the heater and the other to one side of the supply feed. The plunger is held down, so that the circuit to the heater is closed through the disk being pressed down against the two stationary contacts, by a small spring. When the one-ampere load comes on the solenoid raises the plunger, opening the contacts and interrupting the current supply to the heater. When the small load drops off sufficiently the plunger falls back to its normal position, partly by gravity and partly by the pressure exerted by the spring; the contacts are again closed and current continues to flow to the heater.

This relay is simple and is readily made. Various little niceties will suggest themselves as the work progresses—using a spring on the plunger shaft to maintain the disk on the level and in intimate contact at all times, the form of contact to use, etc. Such

a relay permits of easy adjustment, by the spring, by weighting the plunger shaft or movement of the contacts upward or downward, and by the addition of a dashpot using air or oil. This relay, for material, will cost about $4. There are other forms of relays using differential coils, etc., but they are only more complicated ways of obtaining the same result. They are also more costly, more troublesome to maintain, and more liable to get out of working order.—K. R., Chicago, Ill.

No. 310.—Cleaning Commutators.—I would like to know of something which may be safely used around motors and dynamos for cleaning gummy commutators, etc. We have been using gasoline, but have had trouble from sparks from the brushes igniting the gasoline.—A. S. N., Plymouth, Mass.

Gumming may be due entirely to the brush or in part to the brush and in part due to the surrounding air. In some quarters it is rather common practice to use hard carbon brushes which have been boiled for about 12 hours in light lubricating oil and then allowed to drain for 24 hours. Brushes thus treated frequently cause trouble from gumming, especially when operating temperatures are high. Not only do these brushes gum between brush and commutator, but also between brush and brush-holder, with the result that sparking occurs, frequently chattering, and sometimes glowing of the brush tips. With a good grade of graphite brush gumming is absent; and compared with the carbon brush the graphite brush has lower contact resistance, better lubricating qualities, permits of higher current densities and better commutation with less chattering. Graphite brushes are not as a rule very satisfactory for high-voltage machines, that is for machines of 500 volts and above, because of sparking. The substance best suited for the treatment of commutators depends upon the brush used, the terminal voltage of the machine, whether the commutator is slotted or not, and the atmospheric conditions. A little vaseline sparsely applied to a piece of cloth is often efficacious when used on a commutator, but it should be wiped off the commutator by another dry cloth, especially where the machine operates in air charged with foreign matter. For carbon brushes used in a clean station, wiping the commutator with light engine oil and immediately wiping it off again often gives very good results, but it must be remembered that oil tends to cause gumming, the collection of carbon dust (which may result in flash-over if not remedied) and will ruin mica if used too liberally. Kerosene oil gives very satisfactory results and will remove the grease and gumminess from brushes that are causing trouble from excessive oiliness, and it is safe to use even on high-voltage machines. Its function is to clean rather than to lubricate of course, although it is quite satisfactory for this purpose. Paraffin wax is often used, alone or in combination with other substances, of which there are a number on the market. For cleaning a machine after it has been shut down, but still rotates slowly prior to its coming to a stop gasoline is very effective; it removes grease and gum and leaves the machine in good condition in this respect ready for starting up again.—K. R., Chicago, Ill.

In cleaning commutators great care is necessary to thoroughly clean and then dry out the commutator in order to prevent short-circuits, etc. Gasoline is very inflammable and for that reason should not be used in cleaning commutators, especially when the machine is sparking. To clean greasy and gummy commutators, carbon tetrachloride is the best thing obtainable. It readily cuts or dissolves all grease, mineral or vegetable oils, and is as good, if not better, than any other solvent. It will not attack copper, mica, or any other part of the machine; also it will not burn even in the presence of numerous sparks, but on the contrary, will act as an extinguisher. It is very volatile and will dry quickly. It is equally efficient as gasoline, if not more so, and has the added advantage of being far safer to handle, thus helping to bring about "Safety First."—W. T. E. Ansonia, Conn.

The cleaning of greasy commutators with gasoline or benzine is an extremely dangerous practice, the vapors becoming very easily ignited by slight sparks; the rag containing the benzine easily catches fire and endangers the operator. An equally effective and absolutely harmless method to be used during service is to moisten a piece of waste or rag with petroleum (lamp oil) and wipe the surface of the commutator. If the surface of the latter, however, is very dirty, it will be better to apply sandpaper at first. From the question it can be inferred that the commutator gets very quickly "gummy" and requires constant attention and nursing. This is not a very satisfactory state of affairs. One should try to remove the reason for the commutator getting greasy or gummy. It seems that the commutation is not sparkless, and probably the quality of the brushes is not the best suitable for the service; very likely they are too soft and lubricate by their content of graphite too liberally. A harder quality of brushes will probably improve matters considerably. The position of the brushes may also not be the right one, that is, they may not be in that position where there is the least or no sparking. To secure the best suitable grade of brushes for the present case an expert of a firm supplying carbons will best be consulted. If the cause of the commutator becoming dirty is once removed a wiping once each 24 hours is quite sufficient to take off the dust and to maintain good operation.

Should the greasy deposit on the commutator, however, be due to the surrounding atmosphere in which the motor has to work, it would be necessary to protect it againse the detrimental effect of the surroundings. The most convenient and cheapest way would be to provide a nousing of sheet iron with pipes leading into the fresh air, to prevent the motor from being unduly heated in the housing. One pipe serves as inlet for the clean, cold air, the other as outlet. If the distances are not too long the natural draft or a small fan fitted to the shaft of the motor will suffice, otherwise forced ventilation must be resorted to.—H. A., Pittsburgh, Pa.

Gasoline should not be used to clean a commutator while the machine is operating. The method used in a large railroad shop, where I was employed, was to use a piece of canvas made into a roll and the end, being soft and smooth, was applied to the commutator while the motor was running. Where a commutator was gummy, we used a few drops of light machine oil, applied with a piece of cheese cloth, same being wiped dry immediately after application. Gasoline was used only when the machine was idle, to clean the brushes and brush rigging in order to insure their not sticking in the brush holders.—J. H. L., North Cambridge, Mass.

No. 312.—Connection of Bell-Ringing Transformer.—Recently I was called to correct some trouble in a door bell rung from a bell-ringing transformer. I found that the push button was arranged to close the primary circuit of the transformer, the secondary being connected directly to the bell. The contacts of the push were burned from arcing, which did no further damage because it was in a noncombustible case. It was explained that this connection had been insisted on to save the small current that the transformer would take continuously. Is there any provision in electrical construction rules to prohibit this connection?—E. S., Atlanta, Ga.

By referring to Rule 81*d* on page 171 of the 1913 edition of the National Electrical Code, it will be seen that all primary wiring for bell-ringing transformers must be installed under the rules for Class C, that is, inside construction. These rules do not permit the use of bell push buttons on voltages that are under Class C. The bell push must therefore be installed on the low-voltage side of the transformer, unless a push-button switch is used which is approved for the higher voltage.—B. W. C., Detroit, Mich.

THIRTEENTH ANNUAL JOVIAN CONVENTION

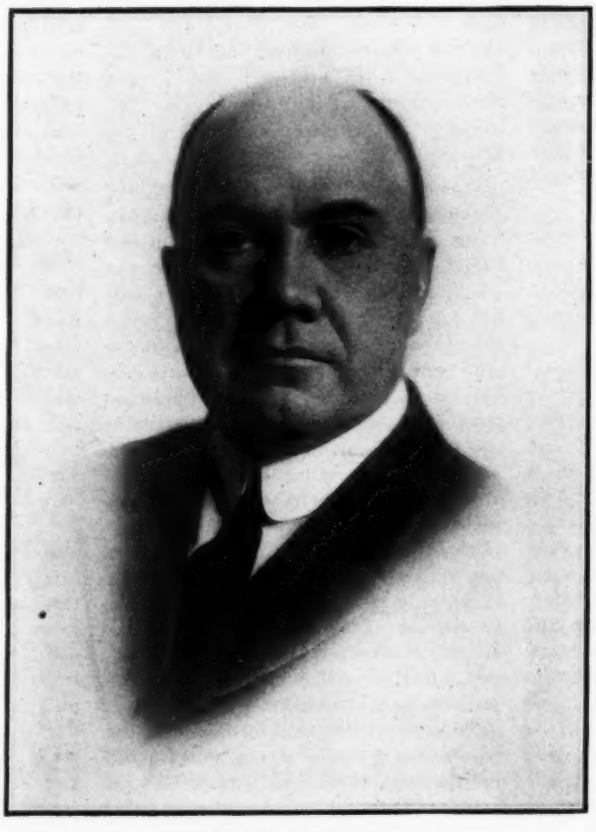
The administration of Homer E. Niesz, Reigning Jupiter of the Jovian Order, was brought to a fitting close by the Thirteenth Annual Convention of the Order, which was held at the Hotel Sherman, Chicago, October 13 to 15. Previous high attendance records were equaled by the registration at this meeting, and in point of importance of business sessions and entertainment new records were established.

The convention opened on Wednesday afternoon, following a complimentary luncheon given by the Chicago Association of Commerce. A report of the first day's proceedings was given in our last issue. Some idea of the growing importance of the Jovian Order may be gained from the report of Mercury Ell. C. Bennett, presented at the first session, which stated that the membership now totaled over 16,000. When it is considered that a large percentage of this membership has been secured during the past five years the importance of the Order and its position as a stimulating influence in the electrical industry may be realized.

The greatest field of activity, of course, lies in communities where local Jovian Leagues or luncheon clubs have been established. There are at present 72 such organizations, and their records of accomplishment are sufficient evidence of the value of co-operative work.

At the session on Thursday morning E. W. Lloyd, president of the National Electric Light Association, delivered a very interesting address on the subject of "Extending the Utilization of Electrical Energy." Mr. Lloyd made reference to the many fields for a wider use of electricity, laid emphasis on the impetus that could be given this growth by active co-operation of the individuals comprising the Jovian membership. The small-customer business is one of the important fields which will have to be cultivated by the central-station companies, and to make this business profitable from every standpoint it is necessary to have inexpensive, efficient wiring devices, fittings, etc. It is not outside of the realm of possibilities for all cooking, heating and lighting of residences in progressive communities to be done electrically. The fulfillment of this condition necessitates, however, the active co-operation of all engaged in the electrical industry.

Mr. Lloyd referred briefly to the possibilities in electric cooking in the Pacific states, and called attention to a report recently presented before the Northwest Electric Light and Power Association in which it was stated that 80,000 electric ranges would be used in that territory within the next five years. Mention was also made of the successful applications of industrial electric heating and the enormous possibilities in this direction, particularly in the automobile field.



Thomas A. Wynne,
Reigning Jupiter of the Jovian Order.

He thought that the greatest field for future development lies in serving rural communities, and much can be gained from the experiences of western companies, where the business has been developed to a much greater extent than in this section. The fact that transformers of as small a capacity as two kilowatts are being used to step down from 11,000 volts directly to 110 volts means that investment in transformers can be greatly reduced. Mr. Lloyd stated that the farmer has a political influence that cannot be longer ignored by central-station companies, and that every effort should be made to supply him at rates that are reasonable and at the same time return a fair profit to the utility.

In connection with conservation of natural resources, Mr. Lloyd thought that the electrical industry has more to do with this than any other business. By the development of hydro-electric plants, the tying together of large centralized power stations many thousands of tons of coal and many thousand barrels of oil can be saved annually. Also, the concentration of manufacturing will be predicated on the centralization of power generation, and this will bring about more economic manufacturing conditions and lower prices of commodities.

Fred M. Feiker, editor of the *Electrical World*, then presented a paper entitled "The Progress of the Electrical Industry." He said the electrical industry differs from every other in that it is primarily founded on science and later developed commercially. In other words, it has grown backwards. He presented statistics comparing the importance of the electrical industry with others, and commented briefly on the rapid developments that have taken place in lighting units, motors, etc.

A. A. Gray, of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, represented the Society for Electrical Development in the absence of Henry L. Doherty, and spoke briefly on the subject of "Electrical Prosperity Week." He called attention to the immense possibilities for developing the use of electricity and electrical appliances if every member of the Jovian Order would consider himself a self-appointed booster and spread the gospel of electricity. Such co-operative work would not only benefit the individual and the industry as a whole, but at the same time would confer a distinct benefit to the community at large.

On Thursday noon those attending the convention were invited to the regular meeting of the Electric Club-Jovian League of Chicago, which was made a Jovian event in honor of the

visitors. Thomas A. Wynne, of Indianapolis, was the first speaker called upon, and he referred briefly to electrical conditions in his city. In spite of the fact that there are two utility companies supplying electricity, the Indianapolis Light & Heat Company, which Mr. Wynne represents, has 40,000 meters in service, or one to every 7 inhabitants. He stated that the capitalization of the two companies was approximately $14,000,000, whereas the capitalization necessary for a company of sufficient size to supply the wants of the city need not exceed $8,000,000. This duplication of investment, of course, places a burden on the citizens as well as on the two companies. Fortunately the rate of return allowed to each company in Indianapolis is based on an actual valuation of the plant, plus a going value. In concluding Mr. Wynne stated that in his opinion the greatest field for the Jovian Order was to educate the public to a proper appreciation of their public utilities.

Following Mr. Wynne brief remarks were made by S. A. Hobson, Frank Dostal, Ell. C. Bennett, F. E. Watts, W. N. Matthews, Harry Pieper and Homer E. Niesz.

On Thursday afternoon the annual degree team competition was held at Powers' Theater. Teams representing St. Louis and Chicago competed. Very creditable exhibitions were given by each team, and the Past Jupiters present, who acted as judges, explained in their verdict that it was extremely difficult to decide upon the winner, because of the closeness of competition. The prize, which is a silver loving cup, was presented to the St. Louis team, also the winners last year, and the individual prize, comprising a jewel valued at $100, was awarded to A. L. Le Masters, of the St. Louis team, who took the part of Pluto.

John F. Gilchrist, president of the Electric Vehicle Association of America, was the first speaker of the session on Friday morning. He spoke on the subject of "Contingent Benefits from Electric Vehicle Sales," pointing out how the exploitation of electric vehicles benefits every branch of the electrical industry. To emphasize this point he referred to the great difference in cost of the wagons and carriages used in the days before the advent of motor cars and the present costs of electrics, both of the passenger and commercial type. While, of course, some of the increased cost has been devoted to strengthening the vehicle itself, a large share of the great difference represents investment in accessories and equipment which the electrical industry supplies.

The importance of the electric vehicle from the standpoint of the central station was emphasized by the statement that the annual revenue of the Commonwealth Edison Company from battery charging amounts to $400,0000 per year. The field in this direction can be realized when it is known that were all vehicles used in Chicago of the electric type the total revenue of the company would be doubled. Mr. Gilchrist referred to the discouragements which the pioneers in the central-station industry had to countenance in the early days, and how these were overcome by the resources and ability of the men who maintained their confidence in the future of the industry. Somewhat the same situation has confronted the electric vehicle business, but with the co-operation of all interested in the development of the industry he believes it is destined to be one of the greatest industries of the country.

W. R. Herstein, president of the Electrical Supply Company, Memphis, Tenn., then presented a paper entitled "The Relation of the Jobber to the Electrical Industry," in which he pointed out the important position which the jobber occupies. Manufacturers who sell their products through jobbers can accurately determine what their total cost of distribution will be by establishing fixed discounts, and, further, they are enabled to have a stock of goods kept in various localities throughout the country. The jobber acts virtually as a warehouse for the retailer, and permits him to carry only such stock as he can quickly dispose of, knowing that additional stock can be obtained in the shortest possible time. The jobber also makes possible the establishment of a larger number of retail establishments than would be possible if the manufacturers had to cover the field. The important function of the jobber is to establish credit relations, and this can be done better in a comparatively small field than by a distant manufacturer who attempts to cover the entire country. Mr. Herstein spoke of the importance of the traveling salesman to the jobber, the friendship which these salesmen cultivate with the retailer being a distinct asset.

At the afternoon session Henry M. Byllesby, president of H. M. Byllesby & Company, Chicago, delivered a very interesting address entitled "The Public Utility as a Factor in the Development of a City." He pointed out that the manager of the utility is in most cases one of the two or three leading men in that community, and if this is not true it is usually the fault of the manager himself. To illustrate the influence of progressive public-utility development on a community, Mr. Byllesby referred to the situation in San Diego, Cal. About 10 years ago the combined gas and electric property was purchased by the Byllesby organization, and new rates, methods and policies were put into effect. The price of gas was reduced from $1.75 per 1,000 cubic feet to $1.00, and the rates for electricity were reduced from over 20 cents per kilowatt-hour to 10 cents. Plants were rehabilitated, service in every direction greatly improved and the employees of the company took an active part in civic affairs. Coincident with this rehabilitation of the utilities a renewed activity was shown in the commercial and industrial affairs, new industries were encouraged on the basis of adequate and reasonable gas and electric service, and coincidently the population of the city increased from about 60,000 to over 100,000.

Mr Byllesby spoke of the regulation of public utilities, and how in many states, because of the inactivity of the men directly interested, laws are being enacted which will eventually work to the detriment of the electrical business. In California, for instance, the company in San Diego, which was referred to previously, is not protected from competition by a municipal plant, although the state public service commission has full jurisdiction over rates, accounting, etc. In the states of Washington and Oregon also the commissions have absolutely no powers to prevent competition of any kind, although they are given the power to valuate the properties and otherwise regulate the utilities. Mr. Byllesby made an earnest plea to the members of the Jovian Order to take an active interest in the civic and political affairs of their cities and states, and see to it that legislation enacted would not curb the development of the industry.

At the conclusion of this address the election of officers for the ensuing year took place with the following result:

Jupiter, Thomas A. Wynne, Indianapolis.

Mercury, Ell. C. Bennett, St. Louis.

For congressmen: Dan G. Fisher, Dallas, Tex.; John F. Killeen, Pittsfield, Mass.; J. H. Betts, New York City; Henry Harris, Pittsburgh; M. H. Moffett, Cleveland, O.; J. F. Ramier, Memphis, Tenn.; C. S. Barnes, New Orleans, La.; H. R. Palmer, Richmond, Va.; Frank D. Beardslee, St. Louis, Mo.; W. R. Patton, Milwaukee, Wis.; H. J. Gille, Seattle, Wash.; J. J. Cooper, Denver, Col.; J. H. Pieper, Los Angeles, Cal.; John F. Ward,

Toronto, Can.; and F. E. Filer, Winnipeg, Montreal.

Entertainments.

The entertainment features of the thirteenth convention surpassed those of any previous convention. On Wednesday evening an informal reception and dance was held at the Hotel Sherman, at which exhibitions in dancing were given by professionals and other entertainment features provided. During the evening a concert was given by the Commonwealth Edison orchestra, led by Morgan L. Eastman, director.

The annual rejuvenation and special entertainment was held at Powers' Theater on Thursday evening, at which a record-breaking class of 323 candidates was initiated. The initiation was conducted by the Chicago degree team, which had competed in the prize contest in the afternoon. An entertainment comprising six very enjoyable acts concluded the evening's program.

On Friday evening one of the most brilliant and remarkable programs ever witnessed as a private entertainment was presented as the culminating event of the convention. This was known as the Feast of Jupiter, and was under the direction of Oscar Dane, of St. Louis. The entire first and second floors of the Hotel Sherman were reserved, and over 200 costumed performers, assisted by a number of orchestras, provided the entertainment. Attending Jovians progressed from one scene to another, partaking of the festivities typical of each scene. During the progress of the entertainment a supper was served, following which there was dancing.

The ladies' entertainment included an automobile ride through the South Side parks and boulevards, with luncheon at the South Shore Country Club on Thursday afternoon; a theater party on Thursday evening, and a luncheon at Marshall Field's and a shopping expedition on Friday.

Civil Service Examination for Fire-Prevention Inspector.

The Municipal Civil Service Commission of New York City is receiving applications until October 27, for an examination to be held in the near future for the position of inspector of fire prevention. The duties of this position include the inspection of buildings with a view to location of deficiencies in construction, number or arrangement of exits, fire appliances, etc. Candidates must be American citizens and residents of New York State, and be between the ages of 21 and 50. The salary ranges from $1,200 to $1,800 a year. The examination will be based largely on experience and knowledge of duties; a physical examination will also be given.

Hydroelectric Problems Considered at Philadelphia Meeting of American Institute.

A largely attended meeting of the American Institute of Electrical Engineers was held at the University of Pennsylvania, Philadelphia, on October 11. Two sessions were held, one in the afternoon and one in the evening; both were confined to the presentation of papers on hydroelectric matters. President J. J. Carty, who presided, opened the meeting by referring to several meetings of national engineering societies held at San Francisco about the time of the recent International Engineering Congress. He noted with pleasure the marked recognition given to engineers on the Coast. The electrical engineer has succeeded, through his improvements in communication and transportation, in obliterating the distances between the various parts of our great country and in enhancing the interests of civilization. Mr. Carty referred briefly to the proposed celebration next year to commemorate the work of the electrical engineer.

John F. Vaughan of Boston, Mass., presented the first paper, entitled "Supplemental Power for Hydroelectric Systems." The first part of the paper outlined the functions of the steam plant furnishing relay and supplemental power for any system whose normal source of power is water and illustrated graphically and otherwise the relative importance of the various functions and characteristics of the supplemental plant. Mr. Vaughan further illustrated by diagrams in a hypothetical case the division of load between the hydraulic and supplemental sources of power. The second part of the paper discussed some general data obtained from a number of New England water-power systems, indicating the extent to which the water power is supplemented by steam and the methods of utilizing the supplemental capacity. The principal uses for the auxiliary steam plants are for low-water conditions and breakdown service, and to a less extent to help on peak load. With few exceptions, plants, either taken over in consolidation of properties, or rebuilt or extended, utilize existing installations or second-hand apparatus, keeping down their idle investment, and those few exceptions are largely continuously operating high-class plants belonging to customers or built for the purpose of high-grade relay of relatively high annual output.

John Abbet Walls wrote the second paper, which was read by A. S. Loiseaux. This paper was entitled "The Combined Operation of Steam and Hydraulic Power in the Pennsylvania Water & Power Company System." This company has built a hydroelectric plant at Holtwood, Pa., on the Susquehanna River only 25 miles from its mouth. This station has, at present, a capacity of 83,000 kilowatts. The river flow fluctuates in erratic fashion, being subject to sudden and unseasonable variations from one-eighth of that required for full power-house output to a maximum flood of 250 times the low flow. Rather than incur investment charges on equipment installed in advance of the time of there being load sufficient to justify its use, the hydraulic plant was so laid out as to permit of extensions being added on the unit plan as they were required. The problem has been to determine, from estimated load growths and from the hydraulic and power contract conditions, the proper division of load between steam plants and hydraulic station, and the resulting advisability of additions respectively either to hydraulic or steam equipment in the endeavor to accomplish most effective combined hydroelectric and steam operation. The results have been very successful, indicating that a river may be developed to an extent many times its low-water flow where there is extended co-operation between customer and power company in determining, by experimenting, the economy of further supply of hydroelectric power.

At the close of the afternoon session, an inspection was made of the new Christian Street Station of the Philadelphia Electric Company, with its 30,000 and 35,000-kilowatt turbo-generators. Directly after dinner at the Hotel Normandy, the members returned to the Engineering Building at the University where the evening session was held.

The paper presented at the evening session was prepared by Charles G. Adsit and W. P. Hammond, and was entitled "Construction Elements of the Tallulah Falls Development." This large hydroelectric system was described in considerable detail, particularly from the construction standpoint. The plant has one of the highest heads in the world. Its equipment comprises five 12,000-kilovolt-ampere vertical generators from which the energy is transmitted at 110,000 volts to Atlanta, Ga., and Greenville, S. C. Outdoor substations are extensively used. The plant was designed to supply power to the greater part of the state of Georgia. To facilitate construction a small water-power plant for driving air compressors and electric light and power generators was constructed. The paper gives complete unit costs of the various items of construction. The cost of the power production plant, including all of the hydraulic works and power-plant equipment, amounted to $66.67 per kilowatt.

ELECTRIC VEHICLE ASSOCIATION MEETS.

That the electric taxicab is a commercial success, is here to stay, and will replace gasoline cars as rapidly as its merits for this service become known, were points that were brought out forcibly at the convention of the Electric Vehicle Association of America, held at the Hotel Statler, Cleveland, Ohio, October 18 and 19.

Aside from the greater economy of the electric taxicab to the operators, its advertising value to the electric-vehicle industry will be of inestimable value, and for this reason alone should be encouraged by all interested in the advancement of the business.

Experiences of a company operating a fleet of electric taxicabs in Detroit, indicating remarkable performances as to efficiency and economy were presented before the convention and received an unusual amount of attention.

Sharing the importance of the electric taxicab discussion was the question of the co-operation of the various allied interests, particularly a better co-operation between central stations companies and manufacturers of the electric vehicle. Walter H. Johnson, vice-president Philadelphia Electric Company, and also of the Electric Vehicle Association, presented a very comprehensive report on this subject, indicating specific channels of co-operation. Coming from an executive of a prominent central station, the recommendations were of particular weight and it was the consensus of opinion that the report should be given a wide distribution among the central-station industry, perhaps through the assistance of the National Electric Light Association.

The question of co-operation and assistance from utilities companies was closely allied with that of battery service to the user and throughout the entire convention the discussions indicated that the development of the industry in the future depends to a very large degree on the establishment of comprehensive battery exchange systems by means of which users can be relieved of the many difficulties attending the proper care and maintenance of the storage battery. A paper presented at the last session dealing with this subject received considerable attention and indicated the trend of the times.

The slogan of the Convention Committee that the sixth annual convention was to be primarily a business meeting for busy men, with many of the usual social features omitted, was borne out by the strenuous program providing for three sessions on Monday, and two on Tuesday, with a dinner-meeting on Tuesday evening as the concluding feature.

The convention was formally opened with an address of welcome by Bascomb Little, president of the Cleveland Chamber of Commerce. President John F. Gilchrist of the Association reviewed the accomplishments during the past year in his address which followed. He reported that it is proposed to again resume the national advertising campaign, somewhat similar to that so successfully conducted two years ago, and a substantial fund for this purpose has already been subscribed. Mention was made of the decision of the Association to publish its own Bulletin hereafter, and statistics were presented relative to membership conditions and finances.

Mr. Gilchrist referred to the growing tendency to establish battery exchange or battery rental systems, and stated that in his opinion some plan of this sort must be worked out to a successful conclusion before the electric delivery wagon or truck can be regarded as an entire success for the use of the small merchant.

Secretary A. J. Marshall in his report dwelt at greater length on membership and financial condition of the Association, and particularly on the stimulating work which is done by the central office. The report further contains a review of the activities of the various sections of the Association, with detailed accounts of some of the advertising and sales campaigns that have been carried on in numerous localities.

The work of the sections was further described by the chairman, or secretary of each individual section, in the report on Section activities which followed.

Monday afternoon session was given over largely to reports of committees and to two papers, one entitled "Industrial Trucks in the Service of the Pennsylvania Railroad Company," by T. V. Buckwalter, and "The Electric Taxicab," by I. S. Scrimger.

The report of the Standardization Committee presented by E. R. Whitney, included several recommendations for standardization which are of particular interest to the electric-vehicle industry at this time. The adoption of two classes of motors for use on electric vehicles was recommended, one class designed for 80 to 85-volt operation; the second class to be designed for 60 to 66-volt operation. Perhaps, with a view to the ultimate adoption of battery-exchange systems the Committee has recommended that the number of cells in lead-acid type batteries, be 42, and the number of the nickel-iron alkaline type 60.

The report of the Traffic Committee outlining its activities in co-operating with various Sections to insure equitable legislation was presented by D. C. Fenner.

In a discussion of the report of the Committee on Standardization the economic advantages of standardizing practice were pointed out, and attention called to the harm resulting from the practice of using batteries that cannot be economically charged at the usual central-station voltages. Those taking part in the discussion were W. P. Kennedy, J. W. Brennan, D. C. Arlington and C. D. Marsh.

The paper by Mr. Buckwalter which was then presented relates the experiences of the Pennsylvania Railroad in using industrial trucks, giving the specifications that have been found most satisfactory. After several years' operation it has been found by this company that industrial trucks should be classified into four distinct divisions, namely, baggage and mail trucks for use in passenger stations; warehouse trucks for freight stations and warehouses; shop trucks for railroad shops and general industrial purposes; and electric tractors for propelling freight cars over street railway tracks.

The paper contains considerable valuable operating data, giving detailed costs and contains a description of a large electric tractor which has been in service for 31 months, and is giving excellent satisfaction. Operating data relative to the performance of this machine indicates that a saving of $32.25 daily is being effected over the cost of horses which previously did the work.

The paper by Mr. Scrimger, entitled the "Electric Taxicab" comments on the heavy expense and unsatisfactory operation of gasoline taxicabs, and the reasons which lead to the manufacture by the Detroit Taxicab & Transfer Company of electric machines, which are now in service.

The average cost of operating the gasoline cab was stated as 30 cents per mile, while the average cost per mile of 12 electric machines now in service is 15.9 cents.

The cab used in Detroit has a 121-inch wheel base, and resembles the high-grade gasoline car in appearance. The public of Detroit has taken very kindly to the electric and the company is replacing its remaining gasoline cabs as rapidly as the electric machines can be manufactured.

W. J. Behn, engineer of the company,

supplemented the paper by giving additional data on the construction and operation of the taxicab. As to its ability to climb hills, Mr. Behn stated that the only tests made had been on a 9.2 per cent grade 210 feet long. From a standing start at the bottom of this hill, the electric reaches a speed of 9.4 miles per hour before reaching the top. The battery equipment used comprises 59 cells, of Edison, A-6 battery. The weight of the car complete is 3,950 pounds. The speed of the car is from 22 to 24 miles per hour, and on a level the amperage draw at the higher speed is 61 amperes. The cars are in operation 24 hours per day, and average mileage is from 75 to 100 per day. Charging plugs are installed along the curbing, at the parking stations in front of various hotels, and whenever a vehicle returns from a trip a boosting charge is given so that the vehicles are always available for immediate service. The motor of the vehicle is of special design and a helical worm drive is employed.

The report of the Legislation Committee, which reviewed briefly the legislation enacted during the past year in the various states, which in any way affects the electric vehicle from either the standpoint of the manufacturer or users was presented by P. D. Wagoner, chairman.

At the session on Monday night the report of the Committee on Central-Station Co-operation was presented by W. H. Johnson. As a result of a canvass made among a large number of central-station companies, several specific recommendations for definite co-operation were made as follows:

(1) The central-station should maintain an electric-vehicle department headed by a competent storage-battery engineer.

(2) Central stations should use electric vehicles—both trucks and passenger cars in every line of work, wherever possible.

(3) Central stations should furnish the communities in which they are located with conveniently situated garage facilities, including facilities for the furnishing of boosting charges in proper localities.

(4) Central stations should make adequate appropriations for electric-vehicle publicity in their particular locality.

(5) Central stations should determine upon the capability of a battery service; or a garage and service station plan, which ever seems to be the most practicable and resultful method of obtaining and retaining the electric-vehicle battery charging load.

The report was discussed by Frank W. Smith, E. S. Mansfield and R. L. Lloyd, it being agreed that the report was of sufficient importance to warrant distribution among central stations generally.

In connection with the use of electric vehicles by central stations, Mr. Mansfield thought that it was an unwise policy to urge utility companies to use electric vehicles for all service simply because of the advertising value to the electric. He held they should be encouraged to use electric vehicles only where the conditions of service would justify such use. He further thought the providing of boosting facilities by the central station an important feature in the wider use of electric vehicles even though such stations are used only a few times in the year.

A very interesting address entitled "Problems We are Facing and How They May be Met" was then presented by George H. Kelly of Cleveland. One of the marked developments during the past year has been in the closer co-operation of the allied interests. The central stations are more than ever doing their part in assisting in introducing the electric vehicle and in lowering rates for energy. The battery manufacturers are giving more attention to greater capacities and standarization so that the problem of care and maintenance is becoming less difficult. The manufacturers of electric vehicles particularly during the past year have brought out new inexpensive cars, and reduced prices on standard cars as much as 15 or 20 per cent without sacrificing in quality or appearance. In fact, Mr. Kelly stated, the manufacturers have reduced prices to a point where their future profits depend entirely on increased sales.

The two main problems in the vehicle industry Mr. Kelly thought were first, creating a demand for electric vehicles and secondly caring for the vehicles after they have been sold.

In connection with stimulating demands the two features which are advanced by prospective users, as objections to the electric vehicle, are low speed and limited mileage. To refute these statements Mr. Kelly pointed out that the modern passenger cars of the electric type can attain speeds in excess of those permitted by any city ordinances, and the radius of mileage on one charge is in a very large majority of the cases greater than the user demands. The electric is primarily a utility car, and as this fact becomes more appreciated through the co-operative boosting of all elements in the electric industry sales will rapidly increase.

In regard to commercial vehicles, Mr. Kelly stated that the prevailing prices of the electric are comparable to high-grade gasoline cars, and operating costs are considerably lower.

A crying need in the commercial-car field is for more garages, or service stations where vehicles and batteries can be given expert attention.

The greatest field for co-operation by central stations lies in the establishment or in the encouragement of the establishment of such garages and in this connection the battery-exchange system would be a big asset to the industry.

Mr. Kelly referred to the use of electric taxicabs and thought it only a question of time before the gasoline car for this service is entirely superseded.

The discussion which was entered into by W. H. Johnson, Samuel Scoville, Gail Reed, E. P. Chalfant and E. M. Jackson, emphasized the desire of both central stations and of manufacturers to co-operate in placing the facts regarding electric-vehicle performance before the public, and refuting the arguments of slow speeds and limited mileage which are now obsolete.

The concluding paper of the session entitled "The Field for the Small Electric Delivery Vehicle," by Charles A. Ward, was in the absence of the author presented by Mr. Boyer. This paper deals with the demand which has long existed for a low cost, light weight, electric delivery wagon, suitable for the small user, which could be operated at a low cost. The new 750-pound Ward delivery wagon developed to meet this need is described, and the vast field for its use pointed out. The author believes that the final solution of the question of how city delivery service is to be electrified, depends primarily upon standardizing the electric vehicle and manufacturing it in sufficiently large quantities to justify a relatively low price. This paper was supplemented by motion pictures showing the progress of a trip made by a standard Ward car, from New York to Cleveland. The start was made from New York on October 6, the car arriving at the Hotel Statler, Cleveland, on Sunday, October 17. During the entire trip no trouble was encountered and the total energy used amounted to only 165 kilowatt-hours.

At the session on Tuesday morning the report of the Official Organ and Transactions Committee, was presented by P. D. Wagoner, this was followed by the report of the Parcel Post Delivery Committee by W. P. Kennedy.

A paper entitled "Comparative Development of the Commercial Power and Electric Vehicle Road," by H. H. Holding, and S. G. Thompson, was presented by the latter. This paper presents some original data, showing that the prevailing impression that the progress of the electric commercial vehicle propaganda is slow is justified only as it relates to those cities where endeavor in this direction has been dis-

couraged, or where no attempt to introduce these machines has been made at all. Comparative curves show that where electric vehicles have been encouraged the progress has been relatively as rapid as have similar gains in other fields of electrical merchandise. Using the history of the popularity of the electric motor in the factory as reference the rate of adoption of the same motive power for the transportation of the products of the factory is, in comparison, highly complimentary to the latter, because the electric motor vehicle is now where the electric drive in the factory was in 1899.

The paper by W. G. Miller and S. G. Thompson on "The Comparative Operation of the Electric and Gasoline Machines in the Same Service," was then presented by Mr. Miller. This paper deals principally with tests conducted to compare the speed of acceleration and deceleration of both gas and electric machines, the probable frequency of stops, expressed in stops per mile, and the total time available for running the vehicle. Resolving these factors to a comparative basis, it is shown that for equal work performance dispite the common belief the gasoline will but slightly excel the electric, which difference is of little consequence when the time saving effected is properly segregated into the different time elements of a nine-hour day.

At this point E. W. Lloyd, president of the National Electric Light Association, addressed the convention on the problems which are confronting the electrical industry, with particular reference to the trend of regulatory legislation. Mr. Lloyd stated that the National Electric Light Association is considering the advisability of engaging experts to handle the various problems that arise rather than have these problems taken up by individual companies.

He thought there was a field for greater co-operation between the Electric Light Association and the Electric Vehicle Association, and suggested that a Committee could perhaps be formed to work out some concrete plan for further co-operation.

As a result of this address H. M. Edwards of New York presented a motion which was unanimously carried that the incoming officers of the Electric Vehicle Association consider means of a closer co-operation with the National Electric Light Association and to consider also the question of amalgamation, if such course should seem desirable.

In the discussion of the two papers on comparisons between gasoline and electric vehicles, which was taken up following Mr. Lloyd's address, J. W. Brennan cited an instance where electric vehicles were employed by a coal contractor, who supplied coal to the plants of the Detroit Edison Company. A competing contractor using gasoline vehiciles was enabled to quote a price fully 60 per cent lower than that of the contractor using electric vehicles, with the result that the electrics were disposed of by the former. Mr. Brennan thought that this was an instance of where electric vehicles were sold without regard to the conditions under which they had to operate, and he believed that this practice was harmful to the industry.

W. C. Brandt of Pittsburgh referred to conditions in that city, particularly in

Walter H. Johnson,

President-elect, Electric Vehicle Association of America.

regard to the use of electric vehicles by a leading department store. Accurate cost records kept by this establishment indicated a saving of 1.5 cents per package in favor of the electric vehicle.

C. E. Miller of Cleveland brought out the point that electric vehicle salesmen must necessarily convince the presidents or other executives of the merits of a vehicle before a purchase can be made. The operating force, however, are seldom approached to gain their co-operation, although the success of the vehicle ultimately depends upon these men.

Mathias Turner, Cleveland, thought that vehicle salesmen must make a study of transportation needs of the establishment which they are soliciting and thus be in a position to recommend the proper type and size of car for each service. Selling vehicle is comparable to selling motor service for factory use and scientific salesmanship is necessary.

The paper entitled "Electric Vehicles in Municipal Service" by A. J. Slade and R. D. Dumont, was then presented by the later. This paper deals exhaustively with the various departments of municipal service where transportation is needed and presents comparative data showing the adaptability and economy of the electric to this work.

The paper was discussed by Day Baker, S. G. Thompson and R. L. Lloyd, in which it was pointed out that the advertising value of electric vehicles in municipal service was of inestimable value. Results of operation for ambulance service and in fire departments has shown that the electric is the first on the street.

The report of the Insurance Committee was presented at the closing session of the convention on Tuesday afternoon. In the discussion of this report it was pointed out that the cost of insurance is becoming a big item in vehicle expense. Co-operation should be given the Committee in its work of impressing on insurance companies the reasons why electric vehicles are entitled to lower rates.

W. P. Kennedy called attention to the low rates which are being secured by individual users in New York by combining and taking out collective insurance, and he thought this a field for activity on the part of the various Sections.

J. W. Brennan, of Detroit, thought that statistics should be collected to prove the contention that there are fewer accidents with electric vehicles than with gasoline. In this connection Secretary Marshall, reported that an effort is being made to have police department analyze accident reports with reference to passenger or commercial cars, and whether gasoline or electric vehicles.

The report of the Committee on Operating Records was presented by Mr. Kennedy, following which George B. Foster presented the report of the Committee on Garage and Rates. The later deals somewhat with battery exchange and suggests that this be handled through the garages.

A paper entitled "The Functions of the Electric Garage" was presented by R. Macrae of Chicago. This paper points out that the function of a garage is not only to store the car and supplying energy for battery charging, but to see that the vehicle receives proper care, and is kept continually in operation. Facilities for carrying on this work can best be provided by the large public garages, and the individual user should be encouraged to keep his car at such places. There is a great need for more garages to care for commercial vehicles and the establishment of these would give great impetus to commercial-vehicle growth.

In a discussion following, Mathias Turner expressed the view that scientific salesmanship is needed to place commercial cars in the field. Transportation problems must be studied by the salesman so that the proper vehicle be recommended for the service.

S. G. Thompson of Newark, stated that during the past few months the power salesmen of the Public Service Electric Company have been acting virtually as electric vehicle salesmen, it being a part of their duty to sell electric vehicles in the same manner as other power using

appliances. The results have been exceptionally satisfactorily, the records showing that the sales made have equaled the aggregate sales in a number of the large cities in the country.

Day Baker, of New York, thought that one practice which should be remedied is that of using scientific terms when trying to interest a prospective purchaser; this not only is confusing but leads to the impression that a highly technical man is needed to operate the cars.

The report of the Nominating Committee was presented and the following officers elected for the ensuing year: President, Walter H. Johnson, of Philadelphia; vice-president, E. S. Mansfield, of Boston; treasurer, H. M. Edwards, of New York. The members of the Board of Directors whose term expired, were re-elected, and John F. Gilchrist was elected to fill the position made vacant by the election of E. S. Mansfield to the vice-presidency.

On Tuesday evening a banquet was held at the Hotel Statler at which brief remarks were made by John F. Gilchrist, W. H. Johnson, S. Scovil, P. D. Wagoner, and W. W. Freeman.

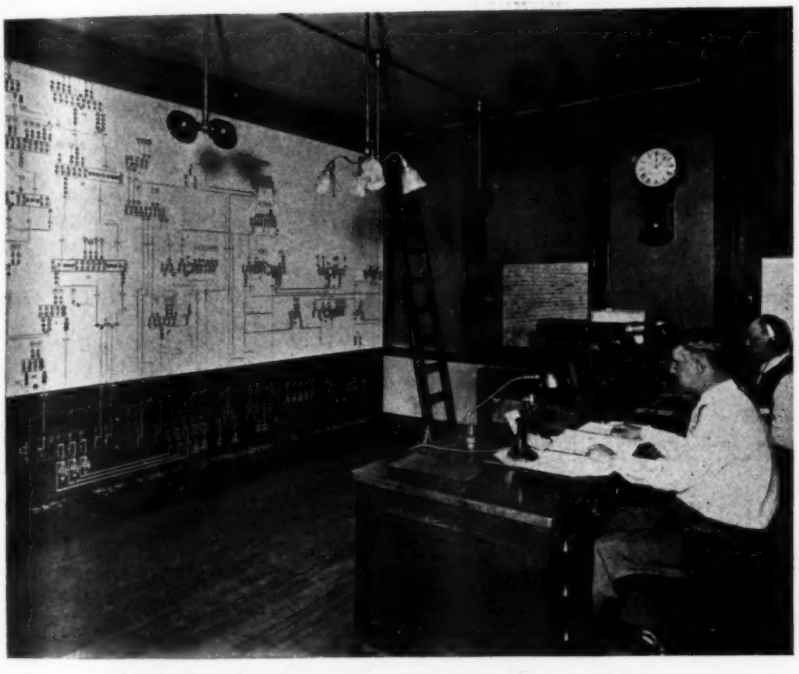
Business Convention in February.

As a forerunner of what is expected to be the most important gathering in the history of the Chamber of Commerce of the United States, comes the announcement that the fourth annual meeting will be held in Washington, D. C., Tuesday, Wednesday and Thursday, February 8, 9, 10, 1916, to the effect of the war on business a large attendance is expected.

Load Dispatching at Boston Described.

At the first meeting of the season of the Boston Section, American Institute of Electrical Engineers, held October 13 at the Engineers' Club, Boston, Pierce Kent, system operator for the Edison Electrical Illuminating Company of Boston, described the method of load dispatching in use by that company. The lecture was illustrated by lantern slides.

L. L. Elden, chairman of the section, presided. The meeting had the pleasure of listening to President J. J. Carty of the American Institute, who spoke on the co-operation of engineers and their recognition at the Panama-Pacific International Exposition. Mr. Carty outlined a plan for the further consolidation of interests of electrical, civil, mechanical and mining engineers. Secretary Ira M. Cushing of the section told of a project for a co-operative engineering society in Boston which should interest many young men.



Load Dispatcher's Board at L Street Station, Boston.
At desk, Pierce Kent, load dispatcher. At switchboard, D. O'Neil, station telephone system operator.

The load dispatchers' board is located in a room on the third floor of the office building connected with the Boston Edison Company's L Street generating station. Adjoining is a sleeping room, equipped with two beds, a kitchenette and other conveniences, to house the operators, if occasion demands.

The board is a large single-line diagram of the company's transmission system, including all inter-station transmission and tie lines and all generating and transforming units at generating and substations.

The board is divided into two sections. The larger section, covering the entire wall directly in front of the operator's desk with its telephone instrument and switchboard, exhibits the 13,200 and 6,600-volt systems; the smaller section, which forms a wing at right angles to the larger, shows the 2,300-volt transmission system. The 2,300-volt, three-wire, three-phase, the 4,000/2,300-volt, four-wire, three-phase, the 230/115-volt direct-current and the 600-volt railway distributing systems are not shown.

The lower part of the board is constructed of fireproof material and represents the engine and turbine generating stations at L Street. Appropriate symbols that are readily recognized represent the various generating, converter and transformer units installed throughout the system.

The upper part of the board is of wood, which permits of easy alterations. On it are grouped graphically all the company's substations.

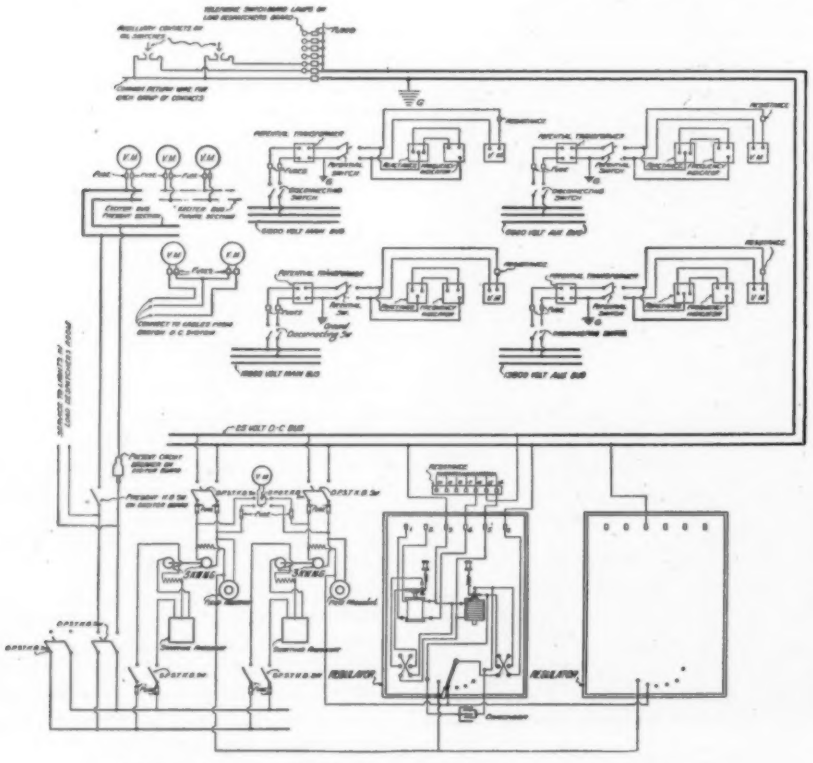
Buses are shown in red, transformer lines and units are indicated by black lines and symbols on a white ground, while on the lower section these are in white on black slate. The disconnecting switches are represented by means of black-topped plugs for which receptacles in the board are placed at the proper locations. Oil switches are represented by red-topped plugs; except that for the generating stations at L Street they are shown by means of telephone-switchboard lamps under green lenses, automatically lighted as the oil switches are closed, by means of contacts installed on the switches.

In addition, there is an instrument board on which are mounted alternating-current voltmeters and power-factor indicators connected with the main and auxiliary high-tension buses, and also direct-current voltmeters connected with the three sections of the exciter buses.

Two motor-generator sets, one of them a spare set, installed in the old engine-room station, supply 20-volt current for operating the lamps on the L Street portion of the dispatcher's board. The motor is operated from the 125-volt exciter system, to insure a reliable source of supply.

In operating, the plugs representing disconnecting and oil switches will normally be in position, representing transmission lines in service, and for the L Street end the miniature lamps will be lighted. If a plug is omitted or a lamp out, thus destroying the continuity at some point in the line diagram, it indicates that the line or circuit is open at that point, and therefore out of service. Similar indication applies to generators, transformer banks and other units.

One man, the load dispatcher, is in control of the dispatching over the entire system. His office is kept informed constantly by telephone in regard to all irregularities of operation and changes of load so that the dispatcher may correct the diagram before him by the removal or insertion of the proper plugs. In case a transmission line opens and drops the load or part of the load of one or more substations, the operator must at once inform the load dispatcher what switches opened, naming the order of opening, if possible, with added information available. Thereupon the dispatcher gives instructions for resuming service at the earliest possible moment.



Wiring Diagram of Load Dispatcher's System at L Street.

Substation operators are at liberty to start machines or resume service on any bus which is still alive, but must not transfer parts of transmission lines to other methods of operation without direct orders from the load dispatcher, as they might increase the trouble and place the system in such a condition that the dispatcher would be delayed in straightening it out. They need not be afraid of overloading transmission lines at such times, but must report to the dispatcher as soon as possible if they have reason to think transmission lines are overloaded.

The operators of substations are also required to report at once any serious irregularities, such as trouble with a generating unit, so that the load dispatcher may prepare to relieve the unit from load as is advisable. In cases of extreme emergency the substation operator may find it necessary to act without word from the dispatcher, but he must always report as soon as possible, with complete information. The provision of the two direct inter-station lines and the regular exchange telephone connection practically insures intercommunication, however.

If a line is to be taken from service for any reason, a permit, in triplicate copies besides the original, must be obtained. The permit specifies the time to start, what is to be done, and the time when the work will be completed. The load dispatcher must sign this and a copy is sent to the originator. Once the line is taken out it is tagged, and then the work is begun. When the work is completed, the same man who applied for the permit communicates with the dispatcher, who superintends the tests and again places the line in service.

The dispatcher's duties include the receiving of trouble reports on lines, apparatus, buses, etc., and the rendering of reports on troubles to the proper parties. He reports daily to the generating department.

Substation operators report approaching storm or darkness to the dispatcher, who takes measures to meet the situation. The vast extent of the Boston Edison system gives opportunity for weather conditions to be quite various at the outlying stations from those prevailing at the time at the central generating station. The load dispatcher's office may be called a clearing house for system operation.

George McMasters, load dispatcher for the Boston Elevated Railway Company, told of conditions and methods of operation. An order board is used, with a direct line to each substation, and the dispatcher does his own operating. Substation men report any extraordinary happenings. The load dispatcher is the final authority for putting in operation various generating units, though the operators of steam stations handle the cutting of third rail and electricity supply at night. Operators start up their rotaries, but must report at once to the dispatcher.

Two new members were admitted to the section, which has increased in membership 100 per cent during the last year. It is now the fourth in point of members, the sections at Schenectady, Lynn and Chicago exceeding Boston in this respect.

Water Powers of the Cascades.

The United States Geological Survey, in co-operation with the Washington State Board of Geological Survey, has made a comprehensive survey of the water resources of the drainage basins of Cowlitz, Nasqually, Puyallup, White, Green, and Cedar Rivers, in Washington. It includes all monthly estimates of river discharge derived from data collected by the water-resources branch of the Geogolical Survey in co-operation with the State Board of Geological Survey and by private persons.

The summaries of the available power in each basin are computed from the average flow for the lowest week on record and from the flow that could be realized from possible storage. The flow with storage is computed on the basis of the continuous discharge that can be maintained by the release of the stored water during the most extreme drought on record, considerable length and severity of low-water periods.

Copies of Water-Supply Papers 253 and 313 may be obtained free of charge on application to the Director of the Geological Survey, Washington, D. C.

Boston Outing.

The annual outing of the office employees of the Boston Edison Company and the General Electric Company at Boston was held October 16 at the Edison Welfare Building. Baseball, tennis, bowling, billiards and pool were afternoon events, while in the evening dancing, music and other attractions were enjoyed by the large number present.

Progress on the Electrification of the Chicago, Milwaukee & St. Paul Railway.

Construction work on the electrification of the western lines of the Chicago, Milwaukee & St. Paul Railway has been prosecuted most actively since the initial order for equipment was placed with the General Electric Company, Schenectady, N. Y., in September, 1914. In view of the magnitude of this project, the progress made to date has been remarkable.

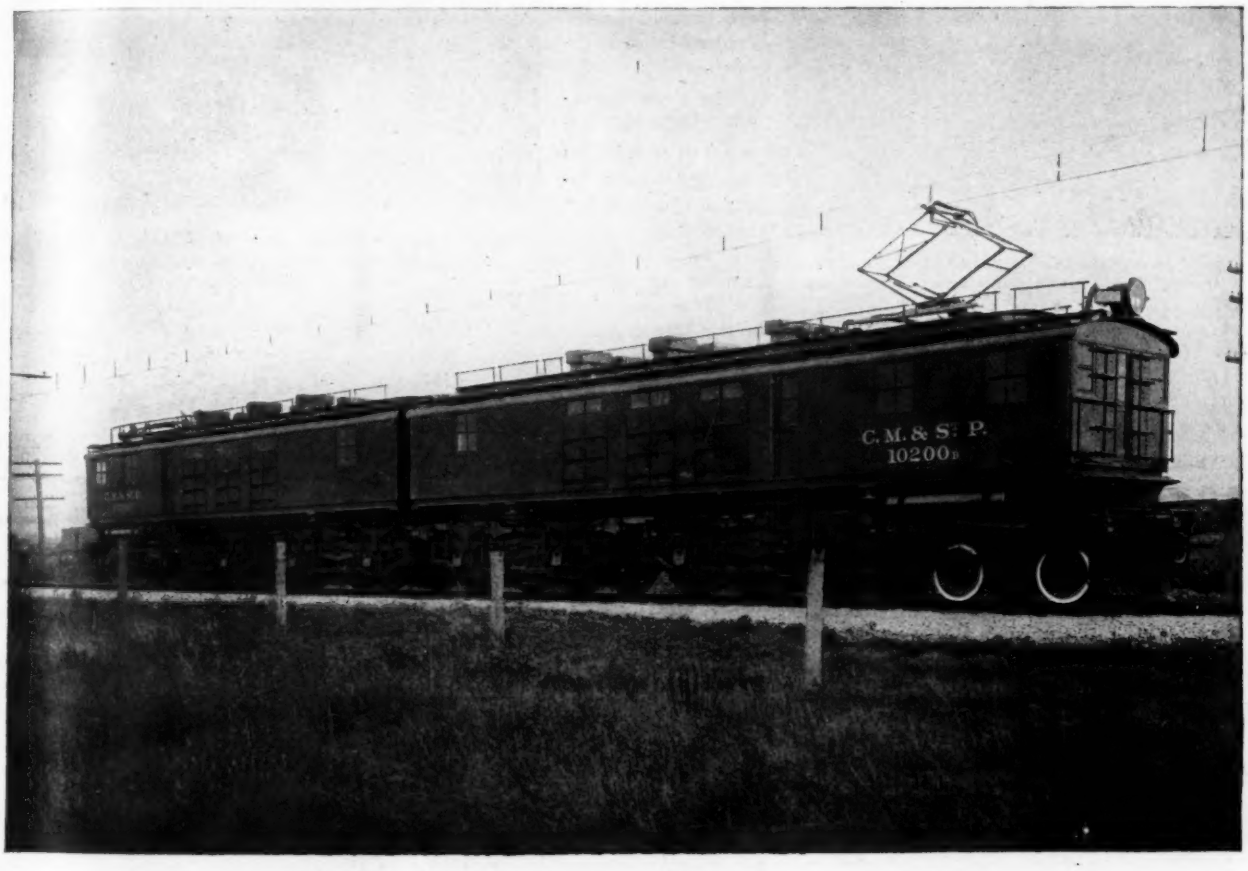
The overhead construction, which will include 650 miles of single track, has been completed for a distance of more than 200 miles. The 100,000-volt transmission line being erected by the railway company to parallel the electrified tracks has been completed for an equal distance, and tie-in lines from the 100,000-volt system of the Montana Power Company are ready for service. The trackage now ready for train operation includes extensive yards and sidings at Three Forks, Deer Lodge and Piedmont and passing tracks at other points. The rail-bonding crews have followed the overhead construction gangs, completing the ground circuits.

Illustrations show the general appearance of the new type of trolley construction and transmission lines. It will be noted that wood-pole construction is used throughout, both for cross-span and bracket constuction. The twin No. 4/0 trolley wires are suspended individually and separately from the same steel catenary and the hangers of one trolley wire are located at points midspan on the other. In the switching yards only one trolley wire is used.

Substations.—Seven substations designed to supply power to the first half of the 440 miles of route have been completed and electrical equipment is being rapidly installed. Complete shipments of transformers, motor-generator sets, switchboards and other accessories have been made by the General Electric Company for the stations first erected, and the equipment of four substations is practically ready for operation. Construction crews are proceeding with the erection of the remaining seven substations shown on the pofile between Deer Lodge, Mont., and Avery, Idaho.

Motor-Generator Sets.—Each of the motor-generator sets consists of a 60-cycle, three-phase 2,300-volt synchronous motor direct-connected to two 1,500-volt direct-current generators. The generators are connected permanently in series to supply 3,000 volts to the trolley. Each set is also provided with an exciter at each end, one providing excitation for the revolving field of the motor and the other supplying the separately excited fields of the direct-current machines.

These sets are in general similar to the five 1,000-kilowatt, 2,400-volt



First of the 42 3,000-Volt Direct-Current Locomotives on Test Tracks.

TABLE OF SUBSTATION EQUIPMENT.

Name of Sub-station	Miles from Avery	Motor-Generator Sets No. of Units	Size KW.	Total KW.	Transformers Size K.V.A.	Total K.V.A.
Two Dot	425.6	2	2,000	4,000	2,500	5,000
Summit	392	2	2,000	4,000	2,500	5,000
Josephine	361.8	2	2,000	4,000	2,500	5,000
Eustis	331.8	2	2,000	4,000	2,500	5,000
Piedmont	289.1	3	1,500	4,500	1,900	5,700
Janney	261.7	3	1,500	4,500	1,900	5,700
Morel	228.3	2	2,000	4,000	2,500	5,000
Gold Creek	192.7	2	2,000	4,000	2,500	5,000
Ravens	160	2	2,000	4,000	2,500	5,000
Primrose	122.2	2	2,000	4,000	2,500	5,000
Tarkio	85.6	2	2,000	4,000	2,500	5,000
Drexel	47.5	2	2,000	4,000	2,500	5,000
East Portal	23.7	3	2,000	6,000	2,500	7,500
Stetson	3.6	3	1,500	4,500	1,900	5,700
		32		59,500		74,600

units in operation on the Butte, Anaconda & Pacific Railway except as regards voltage and capacity. One new feature, however, has been added which deserves mention. This consists of a longitudinal ventilation of the core and field coils similar to that employed in the well known General Electric ventilated railway motor. The use of this method of cooling has effected a considerable reduction in the floor space required per kilowatt.

Typical Overhead Construction on Single-Track Curve. Construction Crew Bonding the Rails.

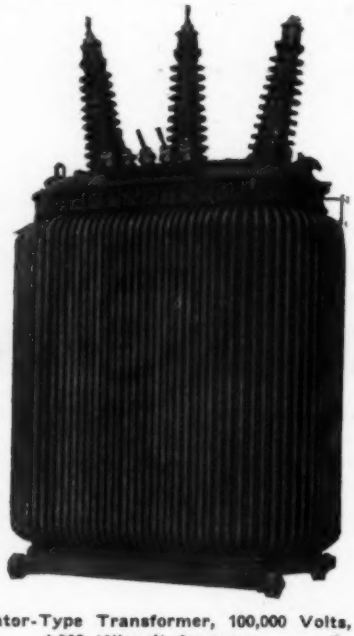
The direct-current generators are equipped with commutating poles and compensated pole-face windings to insure sparkless commutation under heavy overloads. This overload capacity is 150 per cent normal load for 2 hours and 300 per cent normal load for periods of five minutes. This will provide ample margin for starting a train of maximum tonnage on the most difficult grades.

It is interesting to note in connection with these substations that the motor-generator sets are designed to operate inverted in case the regenerated power exceeds that required by other trains operating nearby. For this reason, there is no necessity for water boxes or other energy-consuming devices, since the excess energy is transmitted to the 100,000-volt system.

Switchboards.—The main direct-current switchboard in each station is of special interest, since it represents the latest practice in high-voltage direct-current switching apparatus for heavy currents. A panel is provided for each set and two panels are provided for feeders in each direction.

The circuit-breakers and switches are mounted on separate panels located above and a short distance back of the main panels, similar in general to those now operating in the Butte, Anaconda & Pacific substations. The control handles for operating the breakers and switches are located on the main panels and are connected to the circuit-breaker panels through insulated wooden rods.

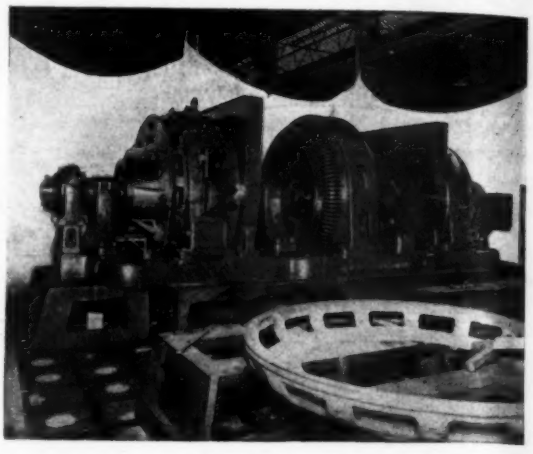
3,000-Volt, Direct-Current Switchboard for One of the Substations.



Radiator-Type Transformer, 100,000 Volts, 1,900 Kilovolt-Amperes.

In addition to the special high-voltage direct-current panels, switchboards are also being furnished for the synchronous motors and auxiliary circuits. Oil switches and other standard 100,000-volt equipment are also being installed for the high-tension circuits.

Transformers. — The transformers, which are under construction in the Pittsfield Works of the General Electric Company, are an example of the most recent design and construction. A total of 32 of these units are to be used for stepping down the power supply from the 100,000-volt transmission line to 2,300 volts as required for the synchronous motor-generator sets. These transformers will be installed in the 14 substations which will furnish power for the entire electrification from Harlowton, Mont., to Avery, Idaho. There are 23 2,500-kilovolt-ampere and 9 1,900-kilovolt-ampere units located as shown in the accompanying table.



2,000-Kilowatt, 3,000-Volt, Motor-Generator Set Assembled for Test at the General Electric Company Factory.

These transformers are all of the three-phase core type with a ratio of voltages of 102,000 to 2,300. For regulating purposes taps are provided for 97,200 volts and 94,200 volts. Taps are also brought out on the secondary windings to give 1,150 volts, or half voltage, for starting the motor-generator sets.

430-Horsepower, 3,000-Volt Direct-Current Motor.

The transformers are oil-cooled and the tanks are of the tubular type, the main body consisting of steel plate with tubes welded to the side of the tank at the top and bottom, giving ab-

solutely oil-tight joints. An air dryer and breather is attached to the tank so that all interchange of air between the interior of the tank and the outside must take place through this channel. This dryer is provided with chambers containing a moisture-extracting medium, thereby preventing the entrance of moisture to the tank.

The bushings furnished with these transformers are weatherproof and as all joints are tight, they are suitable for outdoor as well as indoor operation. At the top of the high-tension oil-filled leads is a glass cup which shows the height of oil in the leads. Accessories, consisting of thermometer, oil gauge and drain valve, are also provided. Each transformer is mounted on flat wheels to facilitate movement for making repairs and a lifting device is furnished for removing the transformer core.

Auxiliary Transformers.—In addition to the main transformer equipment, each substation will be furnished with a standard 10-kilowatt, three-phase transformer stepping down from 2,300 to 110 volts for lighting and auxiliary power circuits.

For operating the railway signal circuits, a standard 25-kilowatt, single-phase transformer is being installed in each substation stepping up from 2,300 to 4,400 volts. A portable oil-drying outfit will be used for removing moisture from the transformer oil. This outfit consists of a motor-driven pump, which forces the oil through a specially designed filter, and the electric drying oven for drying the filter paper. A portable transformer dryer and an oil-testing set will also be supplied.

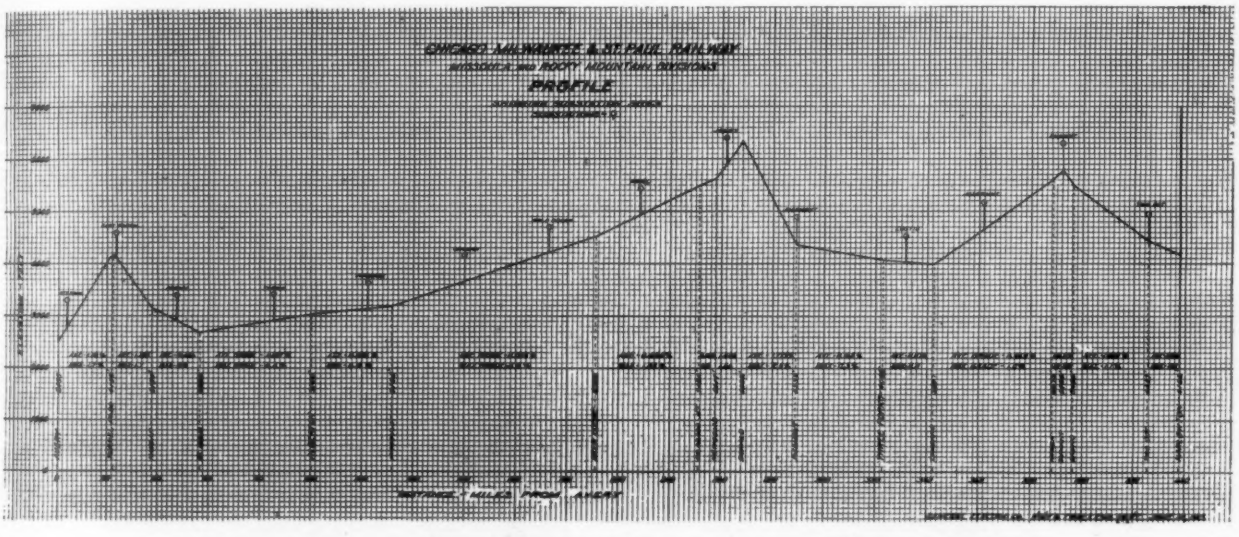
For housing the families of the substation operators, a four-room and five-room bungalow is being constructed at each station and these will be furnished with light and power from the low-voltage auxiliary circuits.

Locomotives. — Work on the construction of the 42 282-ton locomotives for this electrification is progressing rapidly at the Erie Works of the General Electric Company and in the Schenectady plant of the American Locomotive Company. The first complete locomotive was placed on the test tracks early in September and shipment was made as scheduled on September 25. This locomotive was taken in charge by the railway company at Chicago and is now being exhibited at various points on the Chicago, Milwaukee & St. Paul system under the direction of C. A. Goodnow, assistant to the president. A complete set of tests indicate that the locomotive will easily exceed the expectations of the designers.

The actual weights of the completed freight unit are as follows:

Total	564,000 pounds
Weight on drivers	448,000 pounds
Weight per driving axle	56,000 pounds
Weight per guiding axle	29,000 pounds

Twelve of the locomotives on order are geared for passenger service and the remaining thirty are geared for freight service. Both freight and passenger types are equipped for regenerative braking, this apparatus being under control of the engineer. All of the passenger locomotives and several of the freight locomotives will be equipped with oil-fired steam boilers for heating the passenger trains. This equipment will include ample storage tanks for oil and water.



Profile of Electrified Division, Showing Location of 3,000-Volt Direct-Current Substation.

Primary Mercurial Resistance Standards.

The Bureau of Standards, of the Department of Commerce, has just issued a publication, Scientific Paper No. 256, dealing with the construction of four standard ohms.

This unit was defined by the London Congress in 1908 as the electrical resistance offered to an unvarying electric current by a column of mercury at the temperature of melting ice, 14.4521 grams in mass, of a constant cross sectional area and of a length of 106.300 centimeters. The work done at the Bureau of Standards consisted in the construction of material standards representing the unit realized in the form of mercury columns in glass tubes, and the work involved measurements of the highest accuracy of the length, the departure from uniformity of the cross section and the mercury content of each tube, as well as their comparison with working standard. All measurements had to be made at the melting temperature of ice prepared from specially purified water which was used in order to avoid any temperature uncertainty due to possible impurities in the ice.

Electrical comparisons of the four standards showed the average deviation of their individual values from their mean value to be less than one one-hundred thousandth of an ohm.

England, Germany, France, Russia, Japan, and the United States now have mercury standards of resistance which all agree to a high accuracy.

Similarly accurate work has been done at the Bureau with regards to the ampere and the standard volt, so that the public can be assured that the electrical standards maintained at its national standardizing laboratory are of an accuracy far exceeding any commercial requirements.

Copies of the publication referred to may be obtained without charge from the Bureau of Standards, Washington.

New Electrical and Mechanical Appliances

Barrier Cutout Panels and Cabinets.

An ingenious innovation in the design of cutout units for assembly into panelboards has been made by the C. & P. Electric Works. The cutouts are made up as two-circuit units for either two-wire or three-wire systems. They are made of high-grade porcelain and arranged for Edison plug fuses. The busbars are made sectional with one set of sections supplied for each cutout unit. End blocks are provided which, with terminal sections of the busbars, enable a panel of any size to be readily assembled, as shown in Fig. 1. All that is required is a pair of end pieces and the proper number of cutout units. The latter, as well as the end blocks, are reversible to facilitate assembly.

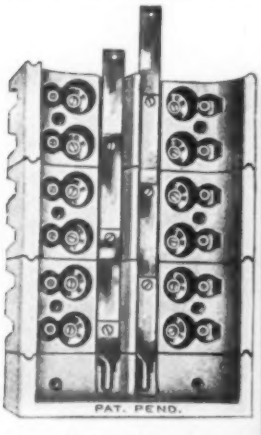


Fig. 1.—Barrier Cutout Panel Partly Assembled.

Fig. 2.—Busbar Ends.

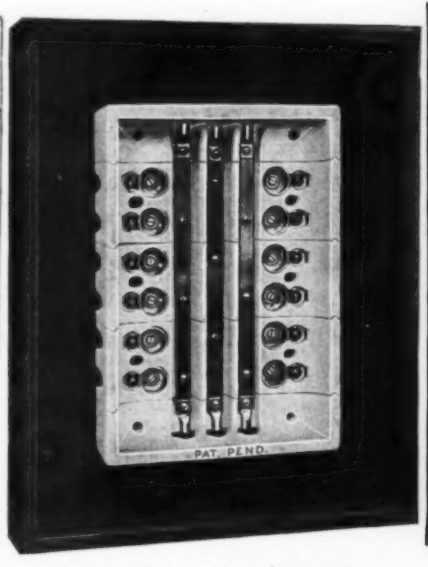


Fig. 3.—Cutout Panel in Steel Box, Showing Wire Gutter.

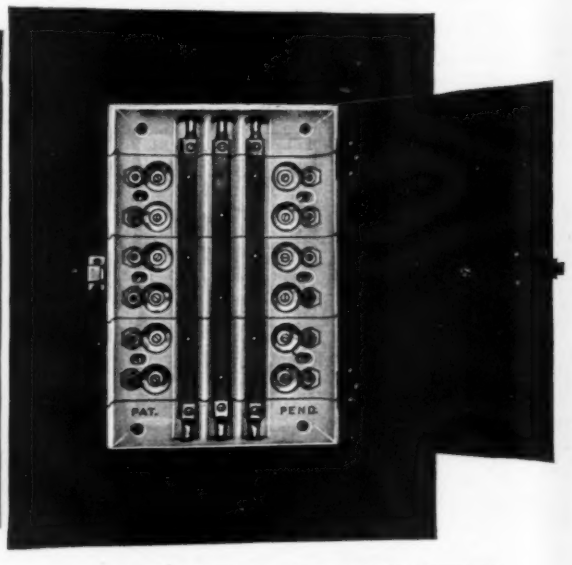


Fig. 4.—Barrier Cutout Cabinet Complete.

The most unique feature of these new units is that they have an upturned outside edge, as do the end pieces; these edges, after the units and end pieces are assembled, act as a continuous barrier between the cutout portion of the panel and the surrounding wiring gutter. This integral barrier eliminates the need of putting in a separate slate or other barrier and saves much time, labor and expense. It also makes a very neat and workmanlike job. A view of an assembled six-circuit, three-wire panel in a steel box is shown in Fig. 3. These steel boxes are 3 inches deep and the gutter is 3 inches wide or 3 by 3 inches in section, making a liberal continuous wireway about the entire panel. Fig. 4 shows the complete cabinet after the steel front plate, including trim and door, is clamped to the box, which is readily done. The views in Figs. 3 and 4 show special cable lugs fitted to the busbar ends. In the latest construction the lugs and busbar terminal sections are combined, as shown at the bottom of Fig. 1 and separately in Fig. 2.

These barrier cutouts, panels, boxes and complete cutout cabinets are manufactured by the C. & P. Electric Works, 92 Hayden Street, Springfield, Mass. James C. Phelps is president of the company, and Henry H. Curtis is secretary and treasurer.

Forty-Watt Gas-Filled Lamps.

Among the exhibits which attracted exceptional attention at the New York Electrical Show that closed last week was the display of the new 40-watt and 60-watt 110-volt nitrogen-filled incandescent tungsten lamps that have just been put on the market by the Lux Manufacturing Company, Hoboken, N. J. This company is the first in this country to produce such small units in nitrogen lamps, as it was also the first to introduce the 100-watt nitrogen lamp in 1914.

The new 60-watt lamp, giving a brilliant white light of about 75 candlepower, is recommended by the company for replacing the 100-watt vacuum tungsten lamp with a saving claimed thereby of about 25 per cent; similarly the new 40-watt lamp, giving about 45 candlepower, is recommended in place of the 60-watt vacuum tungsten lamp.

The 40-watt nitrogen lamp is listed at 75 cents, and the 60-watt lamp at 90 cents. The Lux Manufacturing Company anticipates a very great demand for the new lamps.

The Largest Central-Station Battery in the World.

The Detroit Edison Company, of Detroit, Mich., has contracted for the building and erection of a new central-station storage battery, which will make it the largest in electrical output ever built for emergency use.

The battery will consist of 150 cells, each containing 169 plates of type H Exide construction. Each of the 150 lead-lined tanks will measure 6 feet 7.625 inches in length, 21.75 inches in width, and 4 feet 2 inches in height. Each cell complete with plates and electrolyte will weigh 7,700 pounds.

The capacity of the complete battery will be 12,600 amperes for one hour, or 26,040 amperes at the 20-minute emergency rating. In connection with the operation of this large battery the Electric Storage Battery Company will build four seven-point, 10,000-ampere, motor-driven, end-cell switches, two of these to be placed on each side of the three-wire system. This battery plant will be installed in the Congress Street substation of the Detroit Edison Company, and is expected to be completed for service about December 15 of this year.

Hamilton-Beach Sewing-Machine Motor.

The increasing demands of style are requiring many housewives to spend idle moments in either making or rehabilitating garments to bring them up to the prevailing modes. The sewing of children's clothes, household linens, etc., also remains to be done. To work over an ordinary sewing machine for any length of time is very trying, however, and the development of inexpensive and satisfactory electric motors for operating them is therefore an achievement that meets an urgent demand for means to reduce the labor of working the machine.

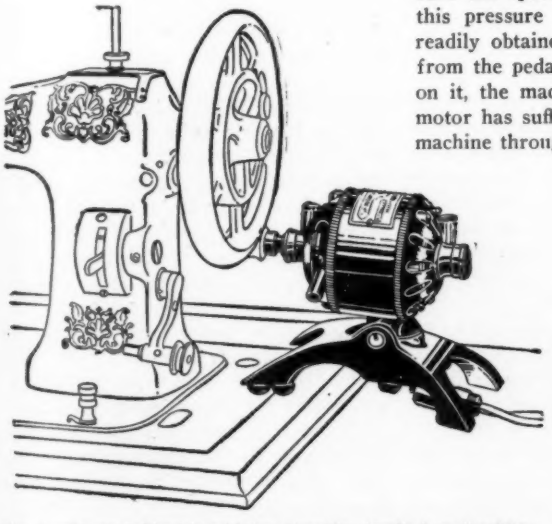


Fig. 1.—Sewing-Machine Motor Readily Applied to Machine.

Fig. 2.—Pedal Controller.

A new type of motor recently put on the market is that manufactured by the Hamilton-Beach Manufacturing Company, Racine, Wis. This motor has been called the "Sew-E-Z" which appropriately explains its value in this connection. A near view of the motor and of its convenient means of application to the machine is shown in Fig. 1. It is apparent from this that no alteration of the machine is necessary to apply the motor. The latter is merely set close to the handwheel so that its grooved pulley presses against it. This friction drive has been found completely satisfactory. The motor is mounted on a simple adjustable stand which permits it to be used with any sewing machine, either of the latest or of the older types. No screws or tools of any kind need to be manipulated in applying the motor; it is merely necessary to remove the old belt from the pulley.

The motor is of the universal type and can be operated on either direct-current or alternating-current circuits of standard frequencies and ranging from 110 to 120 volts. The motor runs smoothly and quietly and can be easily reversed. It is compact and light in weight. Its current consumption is very small and it therefore can be readily connected to any lamp socket or other outlet. The control of the motor is in a simple pedal controller shown in Fig. 2. A slight pressure of the foot starts the motor at a low speed so that the needle operates up and down very slowly. By slight additional pressure the speed increases and by varying this pressure any desired speed can be readily obtained. On removing the foot from the pedal, or releasing the pressure on it, the machine instantly stops. This motor has sufficient power to operate the machine through the heaviest fabrics, and all of the various attachments with the machine can be used just as freely as when the machine is operated by foot in the old-fashioned way.

Heating Steel Shrunk Tires by Electricity.

A machine for heating, by means of electricity, railway and tramway tires preparatory to shrinking them into place is described in a recent issue of *La Revue Electrique*. Its inception is due to the Oerlikon Company. The machine is based on the same principle as the electric induction furnace. The tire to be heated forms the secondary of an induction coil, of which the primary is fed with an alternating current at 220 volts and a periodicity of 50. The temperature required is only 150 degrees centigrade, which is sufficient to increase the diameter of a tire by nearly 3 mils per inch, the shrinkage allowance being 0.7 to 1 mil per inch. The heating is, of course, extremely uniform, and the operation very clean. A tire measuring 32 inches over treads, and weighing 265 pounds can be heated up in nine minutes, the energy expenditure being 2.58 kilowatt-hours.

The electric heater is mounted on wheels for easy transport, and weighs about 950 pounds. The windings of the primary are arranged so that certain sections can be cut out, so that the rate of heating can be adjusted as required.

New Foolproof Electric Hand Lamp.

To the varied assortment of electric hand lamps operated by single dry cells of standard size there has recently been added the Mescolite, made by the Manhattan Electrical Company, 17 Park Place, New York City. In the design of this device special efforts were made to produce a foolproof and reliable lantern.

The outfit comprises a japanned metal container with cover, fiber disk with battery contacts, polished metal reflector, clear glass lens, miniature lamp, lens cap or rim with three bayonet catches, a dry cell and a bail handle large enough to allow the arm to go through it.

New Mescolite Lantern.

The battery cannot be inserted in the container in any other way but the right way. The slotted fiber disk prevents mistakes of this kind. The contact points inside the cover are of unequal width, so that it is absolutely impossible to close the circuit accidentally. After the cap is placed on the container a turn of the button connects the lamp in circuit. The fiber disk with its two phosphor-bronze connectors, is attached to the cell, the slotted part of the disk facing forward as it is being put into the container; a gentle push is all that is required to set it into place.

This lantern is made to take a Red Seal dry battery, size A, and is supplied with a 1.5-volt lamp. The same container will also take a special two-cell dry battery, and when so fitted, a 2.8-volt lamp is furnished.

RAILWAY EQUIPMENT FOR 5,000 VOLTS DIRECT CURRENT.

By Clarence Renshaw.

On June 1, 1915, 5,000-volt direct current was applied for the first time to the motors and control installed by the Westinghouse Electric and Manufacturing Company, for a service test of six months or a year on the Grass Lake and Wolf Lake division of the Michigan United Traction Company. It is expected that this event will prove a memorable one in the list of important contributions toward advancing the art of electric railroading. While there were a few wrong connections and adjustments at the start, as is always the case in the initial operation of any new equipment, these were of a minor nature and were easily overcome; the 5,000-volt car used has now made over 3,000 miles in commercial service. A description of equipment and of the reasons leading to its installation are given in the following article:

In the use of direct current for electric railways, the trolley voltage of 600, so long considered the limit, has, during the past few years, been increased to 1,200 and then to 1,500 volts. The lines where this was first done operated with such universal success that these voltages quickly became common and are now firmly established as standards for interurban work. This development has been of great importance to the art of electric railroading, effecting essential economies in the cost of construction and operation and making possible the handling of heavier train units on light railway lines.

So few were the difficulties experienced in building and operating apparatus for 1,200 and 1,500 volts and so similar to those for 600-volt apparatus were the requirements found to be, that the probable success of further increases in voltage was quickly foreseen. For interurban lines, however, so great a mileage can be operated economically at 1,200 and 1,500 volts and these voltages lend themselves so readily to the interchangeable operation of the same cars on 600 volts also, that no further increases seemed necessary. For heavy electric traction, however, even these voltages leave much to be desired and the increasing interest in this branch of the art led to several installations at 2,400 volts. Here again, it was at once apparent that even at 2,400 volts, the limiting direct-current trolley voltage had not yet been reached.

The next step on a commercial basis was the electrification of the Chicago, Milwaukee & St. Paul Railway, not yet in operation, which will use a trolley voltage of 3,000. Even this voltage, while it will no doubt give excellent results in the case at hand, is not sufficiently high to eliminate current collection from among the serious problems in the design of large locomotives as is done by the use of 11,000 volts alternating current or to hold the number of substations and the cost of line copper within the desired bounds.

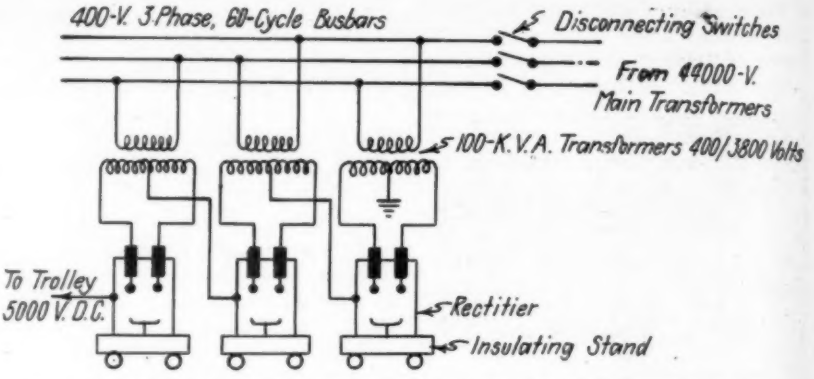


Fig. 1.—Diagram of Rectifier Connections for 5,000-Volt Direct-Current Railway.

With direct-current railway apparatus at this stage of its development, it appeared to the engineers of the Westinghouse Electric & Manufacturing Company, studying the situation, that railway apparatus for 5,000 volts direct current might be entirely feasible. It also appeared that with practical apparatus for this voltage available, the problems of distributing and collecting the necessary power for the largest locomotives likely to be required could be readily solved, so that further increases in voltage would then be unnecessary. It was realized from experience with the use of 1,200 and 1,500 volts that an unnecessary multiplicity of voltages, with comparatively slight difference between them, tended to lead away from the broad ideas of standardization which have heretofore proved so valuable to American railroads and that such a multiplicity of voltages thus tended to handicap the industry. It was evident, therefore, that in view of the tendency toward high direct-current voltages for certain classes of electrification it was desirable to determine as quickly as possible whether apparatus for use at 5,000 volts was practicable or not and, if so, to adopt it as soon as possible as a standard instead of increasing the voltage by small steps in each successive installation.

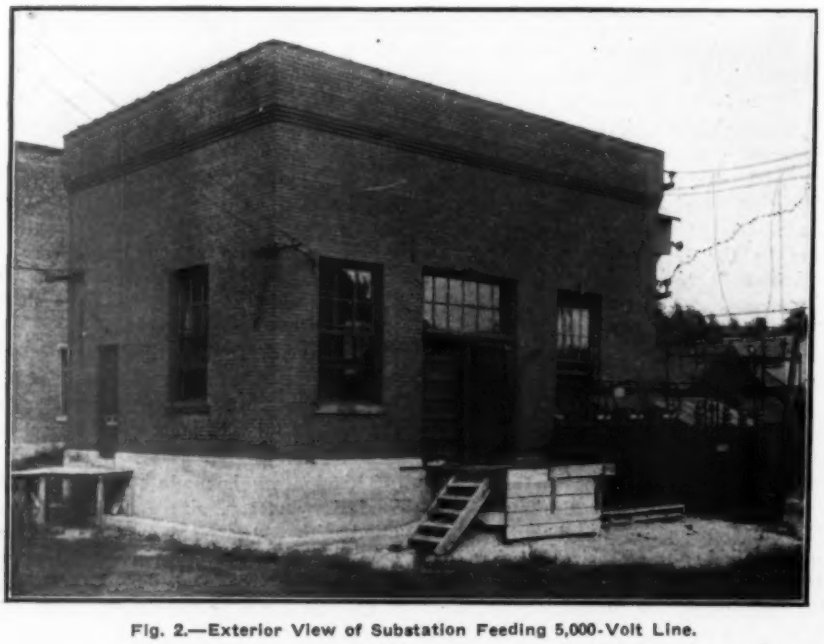


Fig. 2.—Exterior View of Substation Feeding 5,000-Volt Line.

While a great deal of information can of course be gathered from factory tests, it was obvious that actual commercial service was the only really satisfactory way in which the success of railway apparatus, differing in so many particulars from previous practice, could be conclusively demonstrated and it was to secure such a demonstration that the experimental equipment described was installed.

The lines of the Michigan United Traction Company are in the south central part of the state. The section from Jackson to Grass Lake is 11.4 miles long, two miles of which is in the city of Jackson itself, over tracks of the 500-volt city lines. At Wolf Lake Junction, 9.24 miles from the Jackson

terminal, a branch extends 2.71 miles to Wolf Lake, at which there is a small colony of summer cottages.

From the latter part of May to the latter part of September the service requires two cars, except for one trip late at night. Opportunities for running the 5,000-volt car during this period therefore were somewhat limited. During the remainder of the year, however, a single car service is sufficient and as this is now going into effect, it is expected that the high-voltage car will perform practically the entire service and thus be given a thorough test.

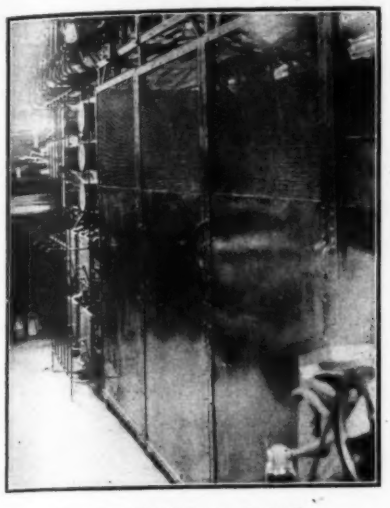


Fig. 3.—Steel-Tank Rcetifiers.

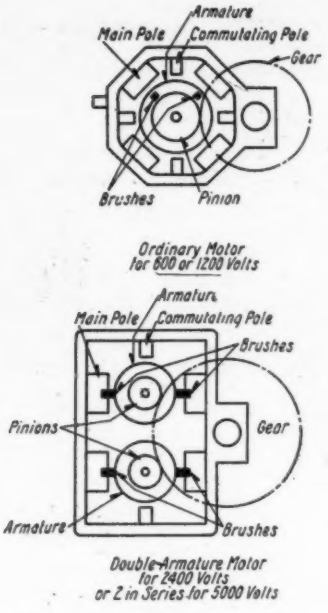


Fig. 4.—Comparison of Motors.

In revising the 600-volt trolley line for use on 5,000 volts, the construction was modified by merely removing the usual 600-volt insulator and replacing it by a type PG porcelain strain insulator located in the span wire at each side. This simple and inexpensive arrangement has been remarkably satisfactory and has not given a minute's trouble during the many months the line has been in use.

The 5,000-volt trolley is separated from the 500-volt one at the outskirts of Jackson by an insulated section of slightly greater length than the car. This is normally dead, but by holding a long rope attached to an air-break switch on an adjacent pole, it can be energized with 5,000-volt current. When the car is coming from the 500-volt line, it is stopped on the dead section until the change-over switch has been thrown. By holding the rope, the section is then energized with 5,000-volt power until the car has left it, after which the rope is released and the section again becomes dead. When the car is coming from the 5,000-volt line, it coasts entirely over the insulated section to the 500-volt line and the change-over switch is then placed in the 500-volt position.

Direct-current power at 5,000 volts for operating the car is obtained from steel-tank, mercury-vapor converters located in the substation at Grass Lake, which supplies 600-volt power for the normal operation of the line and for operating a neighboring line of the Detroit United Railways. Three of these converters, with their alternating-current terminals connected one set to each phase of the 400-volt, three-phase, 60-cycle busbars of the station and their direct-current terminals connected in series as shown in Fig. 1, are used for normal operation and a fourth is installed as a spare unit.

The use of vapor converters for supplying power is in no way an essential part of the test for the 5,000-volt equipment, but is an entirely separate experiment. These converters seemed to afford the most convenient and inexpensive means for obtaining power at the desired voltage, particularly in view of the small space available in the station for the installation of additional apparatus, and they were adopted for this reason. As it was, the transformers had to be located out of doors and the converters themselves crowded into an out-of-the-way corner. Fig. 2 shows an outside view of the station including the ransformers and Fig. 3 shows the sheet-iron cells in which the converters are mounted, as well as the switchboard which controls them. This installation is the first in which vapor converters have been connected in this way to a three-phase circuit or have been used to produce so high a direct-current voltage. It is also the first case in which converters of the steel-tank type have been operated from 60-cycle power.

The most interesting and important items of the installation are, of course, the car used and its equipment. Car No. 62 is a standard wooden interurban car, approximately 56 feet long overall and weighing approximately 40 tons complete with equipment but without load. The equipment consists of four motors, each rated at 100 horsepower, 2,400 volts, connected two in series for operating on 5,000 volts, together with a suitable outfit of type HB unit switch control. Operation in the city of Jackson is provided for by a change-over switch, which regroups the motors for the service.

The gearing is such that the car attains a free running speed on the level of about 48 miles per hour on 5,000 volts, or 20 miles per hour on 500 volts. When running at full speed on the former voltage, it requires approximately 30 amperes with a maximum during acceleration of about 2.5 times this amount. The car is particularly "snappy" in its action and accelerates rapidly yet smoothly on both voltages.

The use of so high a voltage as 2,500

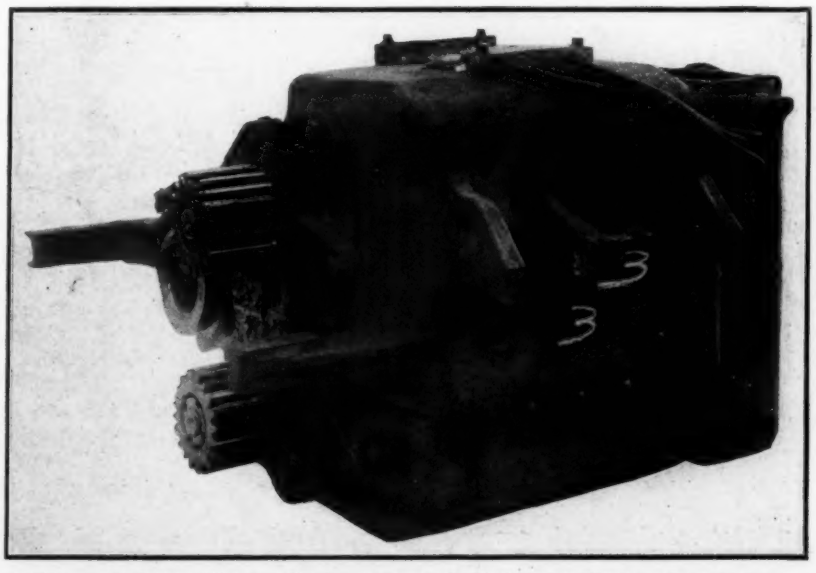


Fig. 5.—Exterior View of 100-Horsepower, 2,400-Volt Double-Armature Motor.

Fig. 6.—Switch Group for 5,000-Volt Service With Covers Removed.

at the terminals of each motor is made possible by the fact that the motors are of the double-armature type. In this type of motor each field frame contains two entirely separate armatures with independent pinions which are connected together by meshing in a common gear. While the voltage at the terminals of a motor is 2,500, therefore, that on any one commutator is limited to 1,250 volts.

This principle, perhaps, will be more clearly understood by reference to Fig. 4, where the arrangement of this type of motor as compared to the usual 600 or 1,200-volt railway motor is shown in diagrammatic form. The appearance of the actual motor from the pinion end is shown by Fig. 5. While this motor looks extremely deep as compared to the more nearly circular forms in general use, there was no difficulty in mounting it on 37-inch wheels with entirely satisfactory clearance. Access to the upper brushes is obtained by the usual commutator lid at the top of the motor. The lower ones can be easily reached from a pit through a similar opening at the bottom.

Opening and closing of the 5,000-volt circuit is accomplished by switches of the double-break type so that a large number of circuit-opening breaks in series is obtained with a comparatively small number of switches. The general arrangement of these switches is similar to that of the single-break electropneumatic switches ordinarily employed for 600 or 1,200-volt equipments, except for having double breaks. One of the two six-switch groups of these switches which are employed on the car is shown, with covers removed, in Fig. 6. Certain additional switches, which are never subjected to high voltage, are of the ordinary 600-volt type.

Power for operating the air compressor, arc headlight, car lights and control circuits is obtained from a 150-volt storage battery, which is charged by being connected in series with the motors during 5,000-volt operation and by being connected to the trolley through a resistance during 500-volt operation. The battery is protected from the action of heavy peak loads by a set of counter-electromotive-force cells, connected in parallel with it. These act as a safety valve and shunt off some of the motor current from the battery in case this exceeds the safe capacity of the latter. Experience has proven that in the case of this equipment the battery is of such ample size that the counter-electromotive-force cells are really not necessary.

Overload protection is afforded, as is usual with equipments of unit-switch control, by an overload trip relay. This relay, on being operated, causes all of the main circuit-breaking switches of equipment to open and thus cut off power. The change-over switch for modifying the connection for 500-volt operation is of the oil-insulated type and is manually operated by a suitable lever at the side of the car. The trolleys are of the ordinary wheel type; each is mounted on a suitable insulated base. Protection in handling the trolleys is afforded by a long wooden insulator inserted in each of the ropes. The reverser, resistance, master controllers, control switches, etc., are of the usual type and require no particular comment. The operation of the control apparatus on both 3,000 and 500 volts is clearly indicated by Fig. 7, which shows a schematic diagram of the main circuit connections and a sequence numbering to indicate the order of closing of the switches, etc.

The development of this equipment along the lines described has been so straightforward and difficulties of every kind have been so noticeable by their absence that the case seems a most remarkable one. Operating as circumstances permitted, for one or two round trips per night, since the initial trial on June 1, the car has made over 3,000 miles with a record of 100 per cent. The equipment has not required repairs of any kind, nor even cleaning, and it has not given a minute's trouble. The commutators of the motors have taken on an excellent polish and many of the switches in the control look as though they had never been subjected to current. Owing to the intermittent running which has been necessary so far, the mileage is of course small, but for the class of troubles which would be most expected on such an equipment, intermittent periods of running and of standing without attention probably afford as severe a test in many ways as a much greater mileage made by more continuous operation.

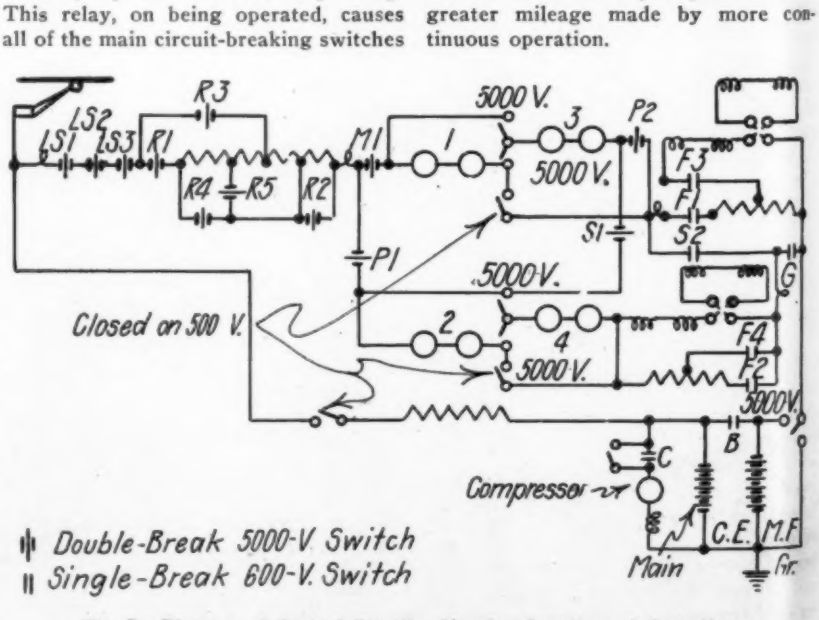


Fig. 7.—Diagram of Control Circuits, Showing Sequence of Operations.

Without any particular effort to secure small dimensions or light weight, it has been easily possible to mount the apparatus on this small car without crowding and without placing any parts under the platforms. The weight of the complete motors is not excessive and the armatures are particularly small in diameter and light in weight. Commutators and brushes are reduced to a minimum so that at least two of the ideal characteristics for railway motors have thus been secured. The high-voltage switches are small in dimensions and the entire control equipment is reasonable in weight and moderate in its space requirements.

While it might be expected that in handling current at so high a voltage excessive arcing would result, it has been found that on account of the extremely small currents required and the greater number of breaks in series the results are just the opposite. With the covers of the switch groups removed, the car locked by the brakes, and the control thrown on and off, the arcing at the switches on this car with 5,000 volts on the trolley is noticeably less than when a 600-volt car is handled in the same way.

An incidental effect of considerable interest is the operation of the car lights and auxiliary circuits from a storage battery, so that a brilliant uniform illumination is secured at all times. Until the crews became used to this feature, it sometimes led to amusing results on account of the trolley coming off of the wire and the men not noticing it because the lights continued to burn.

One of the fundamental requirements of any system of electrification, in order that it may be generally applicable with best results, is that it shall be suitable for operating small multiple-unit cars as well as large locomotive units. It is obvious from this installation that the 5,000-volt direct-current system can readily meet this requirement, as the present car and equipment is smaller than it has heretofore been possible to secure even for 2,400-volt service.

The installation of this equipment on one of the lines of the Michigan United Traction Company is due to the broadmindedness and foresight of the late W. A. Foote and his associates, Messrs. Silliman and Collins, and is an evidence of the growing appreciation of the modern idea that the development of more efficient apparatus, and improved systems, is not a matter which concerns manufacturers alone, but is of vital importance to operating companies as well. Much of the success of the operation is due to the hearty co-operation of Messrs. Morgan and Taylor and other operating officials of the road. That the announcement of the main facts and preliminary results of this experiment is made at the present time, instead of keeping the matter entirely quiet until the final results had been attained, and the apparatus is ready for the market, is likewise evidence of another modern idea.

New Vacuum Pump.

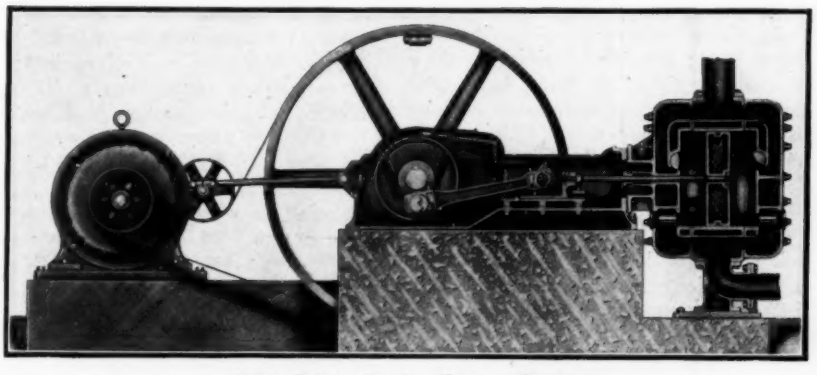
The vacuum-pressure impregnation processes in common use for impregnating electrical field coils, armatures, and the like bring into use a vacuum pumping apparatus. Again, the modern power house invariably includes a condenser plant, the efficiency of which depends upon the degree of vacuum within the condensing apparatus. For maintaining this vacuum and for general service in other lines where a high degree of vacuum is desired, the Ingersoll-Rand Company, 11 Broadway, New York City, has recently introduced a complete line of steam and power-driven, duplex type, Imperial vacuum pumps.

In general design these machines follow that of the Imperial air compressors, a type with which engineers and power-plant operators are long familiar. The vacuum cylinders, as will be seen from the sectional illustration, are somewhat different from those ordinarily met with. The intake valves are of the Corliss type, so placed in the cylinder head that the clearance is exceptionally low. This is a desirable feature in that the air trapped in the clearance spaces at discharge pressure will not reach such a volume, upon being expanded to intake pressure, as to greatly limit the pressure reduction which may be obtained. The action of the valve is positive and quick, and its action being independent of the cylinder and intake pressures, the pressures within and without the cylinder are as nearly equal as possible. The intake ports are large and direct which, together with the water jacketing of the valve, tends to cool the intake gases or vapors.

The discharge valves, which are of the direct-lift poppet type, are placed in the bottom of the cylinder heads so that any entrained moisture or water is immediately discharged, a feature that makes for safety in handling moist or even saturated vapor. Clearance at the point of discharge has been reduced by making the valve partially fill the port in the cylinder head. The discharge passages are also water-jacketed.

The cylinders are said by the manufacturer to meet fully the requirements of satisfactory and efficient operation. Air passages are unobstructed. The bolts pass from head to head and hold cylinder and heads tightly assembled. Both cylinder and heads are completely water-jacketed, which is said to be an essential feature in the design of vacuum pumps, as the high ratios of compression tend to create high discharge pressures unless the heat is removed as generated.

Unusually low clearance in Imperial vacuum pumps has been obtained, not by dangerously close piston clearance, but by improved design of the valves and valve ports. Owing to the extremely low clearance, the complete water-jacketing, the use of mechanically operated Corliss inlet valves and other refinements of design, the manufacturer guarantees the easy maintenance of a vacuum of within one-half inch of barometer.



Motor-Driven Duplex-Vacuum Pump.

The running gear, that is, the main frame with its inclosed reciprocating parts, the crankshaft, connecting rod, crosshead, valve gear and flywheel on both belt and steam-driven machines are of the same design as in the Imperial air compressor. Lubrication is by the bath system, providing automatic flood lubrication yet retaining by the removal of covers from the casing, all the points of accessibility of the open type of machine.

These machines are built in capacities from 798 to 7,048 cubic feet per minute, both for atmospheric and low-pressure (five pounds) discharge. The manufacturer claims for these vacuum pumps that they operate practically independent of attention.

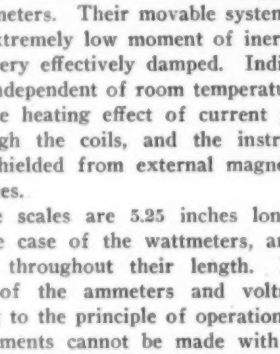
New Weston Portable Electrodynamometer-Type Ammeters, Voltmeters and Wattmeters.

Problems hitherto considered impossible of solution have been solved in the designing of a new line of portable electrodynamometer instruments recently put on the market by the Weston Electrical Instrument Company, Newark, N. J. They are the latese development in instruments of this type and embody characteristics never before attained.

Included in this line are ammeters, voltmeters and single-phase and polyphase wattmeters. They are all instruments of precision adapted for use on either alternating-current or direct-current circuits, even in the case of the polyphase wattmeters. Their movable systems have an extremely low moment of inertia and are very effectively damped. Indications are independent of room temperature and of the heating effect of current passing through the coils, and the instruments are shielded from external magnetic influences.

The scales are 5.25 inches long and, in the case of the wattmeters, are uniform throughout their length. In the case of the ammeters and voltmeters, owing to the principle of operation, these instruments cannot be made with scales that are uniform throughout their entire length, but the upper four-fifths portion of the scale is remarkably legible and uniform. Each scale is hand calibrated and is provided with a mirror over which the knife-edge pointer travels and the pointers are equipped with a simple zero-setting device.

Each of the instruments is contained in a highly polished mahogany box provided with carrying handle, lock and cover with slip hinges. The weight complete is about 11 pounds, except the polyphase wattmeter, which weighs 17.5 pounds.



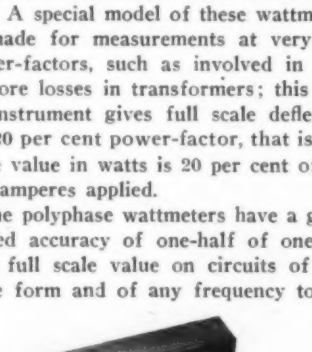
Electrodynamometer-Type Voltmeter.

The voltmeters and ammeters are guaranteed to an accuracy of one-fourth of one per cent full-scale value either on direct-current or alternating-current circuits of any wave form and of any frequency to 133 cycles per second, and any commercial frequency even as high as 500 cycles per second with very slight error. Single or double ranges are furnished in these instruments. Potential transformers or multipliers can be obtained for increasing the range of the voltmeters. For increasing the range of the ammeters on alternating-current circuits, current transformers can be secured.

The single-phase wattmeters have a similar guaranteed accuracy. Each of these instruments is provided with double ranges for both current and voltage circuits. All of the current ranges can be used for 100 per cent overload indefinitely without introducing error. This permits use on power-factors as low as 33 per cent when used to full scale capacity. A special model of these wattmeters is made for measurements at very low power-factors, such as involved in tests of core losses in transformers; this type of instrument gives full scale deflection for 20 per cent power-factor, that is, the scale value in watts is 20 per cent of the volt-amperes applied.

Portable Ammeter.

The polyphase wattmeters have a guaranteed accuracy of one-half of one per cent full scale value on circuits of any wave form and of any frequency to 133 cycles. They can be used on circuits of any frequency, even as high as 500 cycles per second, with very slight error due to phase displacement. All current ranges can be used for 100 per cent overload indefinitely without introducing error. This form of instrument really consists of two single-phase wattmeters, electrically independent, but with their movable coils mounted on a common shaft so that they rotate together; each coil, however, moves in its own set of field coils.



Single-Phase Wattmeter.

These wattmeters have double current and double voltage ranges in each phase. The current ranges are controlled by a set of links in each phase, as in the case of the single-phase wattmeter; the potential ranges are controlled by a full set of independent binding posts for each phase. This arrangement permits these wattmeters to be used directly for power measurements on direct current, on single-phase two or three-wire circuits, on two-phase three or four-wire circuits, and on three-phase circuits.

Polyphase Wattmeter.

Electrically Driven Dry-Dock Pumps.

The electrification of the F. O. Smith Shipbuilding & Dry Dock Company's dock at Norfolk, Va., is a notable example of the saving that can be effected by the use of electricity in shipyards.

Previous to July, 1912, the dry dock was operated by old-fashioned steam-driven bucket pumps. With this equipment practically half a day was required to make a haul and occasionally trouble was experienced with the operating machinery. Being aware that with these defects the dock could not meet with great success, the owners sought for means to improve the operation and shorten the time required to lift a vessel. As a result of investigation it was decided that electrically driven pumps should replace the steam equipment. Accordingly twelve 20-horsepower Westinghouse vertical motors, coupled to 10-inch Morris centrifugal pumps, were installed.

The installation met with such immediate success that not long ago another section was added and six additional pumping units, duplicates of the ones previously installed, were purchased and placed in position.

It is now possible with this new equipment to lift a vessel high and dry in 17 minutes at an energy cost of about $4.50, whereas with the old equipment it required half a day and cost from $12 to $15.

In addition to the electrically driven pumps on the dock, the shipyard is provided with an electric welding outfit, equipped also for cutting.

Current Electrical News

ATLANTIC STATES.

LUDLOW, VT.—This municipality has voted to authorize the Light Commissioners to contract with the Colonial Light & Power Company for electricity in either auxiliary or unlimited service and to borrow $3,000 to pay for the construction of a transmission line to connect the local power plant with the Colonial Company's system.

OXFORD, MASS.—The Webster & Smithbridge Gas and Electric Company will make extensive additions to the street-lighting system of this town.

WORCESTER, MASS. — The city council has voted it inexpedient to act on requests for 684 new luminous-arc street lamps, the council preferring to wait until a systematic plan for uniform distribution of illumination has been worked out. The superintendent of street lighting favors a general extension of the present street-lighting system to cross streets, which, if adequately lighted, would tend to divert traffic from the congested main thoroughfares. A number of new tungsten lamps will be installed at once, and the extension of the arc-lighting system may come after December 1.

ROCKVILLE, CONN. — The Rockville Chamber of Commerce is planning to install a modern lighting system about Central Park. Address William A. Howell.

NEW YORK, N. Y.—The General Erecting & Improvement Company, 9 East Fortieth Street, New York City, has the general contract for the construction of a $5,000,000 plant for the Continental Dry Dock & Shipbuilding Company. Contracts for the different parts of the plant will be sublet, and the company will be interested in corresponding with engineers and contractors with respect thereto. The company is also interested in receiving lists and quotations regarding machinery and equipment.

SYRACUSE, N. Y.—The Syracuse Lighting Company will shortly erect three concrete and steel substations.

PHILADELPHIA, PA. — Three school buildings, to cost $500,000, $250,000 and $200,000, respectively, will be erected by the Board of Education here. Bids will be asked for in a few weeks. J. Horace Cook is the architect in charge.

PHILADELPHIA, PA.—A hospital building and a power plant to cost $250,000 will be erected for the Misericordia Hospital at Fifty-third Street and Cedar Avenue. E. F. Durang & Son are the architects.

WILKES-BARRE, PA.—A four-story brick, stone, concrete and steel Masonic Temple will be constructed here. The interior illumination will be of the highest order. Sturdevant & Poggi, Reading, Pa., are the architects.

BALTIMORE, MD.—Plans were laid before the Board of Estimates of Baltimore last week by Lighting Superintendent Mohr, under instructions from Mayor Preston, for the extension of the white way lighting system to Hanover Street, from Lombard to the approach to the new Hanover Street bridge, and also for the lighting of the bridge. Mr. Mohr told the board in a letter that the lighting of the new bridge would cost the city of Baltimore about $6,000 a year. He said that the structure was 8,600 feet long. Of this distance 2,300 feet represent the bridge proper, the remaining 6,300 feet being the length of the roadway from the Baltimore County end of the bridge to the Brooklyn shore of Spring Gardens. It was stated that the State Roads Commission would install the lighting fixtures, the plan being to erect combination trolley and electric lighting poles spaced about 100 feet apart. Ornamental poles will be used, and there will be two incandescent 100-watt lamps on each pole. The type of lighting, so far as the candlepower and globe fixtures are concerned, will be the same as has been adopted for other municipal bridges. Mr. Mohr said there would be 356 lamps on the Hanover Street bridge. He stated that the cost of installing and equipping white way lamps on Hanover Street, from Lombard Street to Windser Street, the approach to the bridge, would be $11,765.

BALTIMORE, MD.—Harbor Engineer H. Kent McCay was instructed by the Board of Estimates to prepare specifications for advertisement for the conversion of the old gate house at Druid Lake into a hydroelectric plant, to supply electric current to the city for the lighting of the White Way lamps. The power for the operation of the plant is to be obtained from Jones Falls. The specifications will provide that the current is to be sold to the city at a flat rate, and with the further understanding that the plant would revert to the city at the end of 10 years. The current is to be brought into the city and distributed from a central station to be erected on the ground floor of the old Polytechnic Institute on Courtland Street. The decision of the Board of Estimates last week was the result of an opinion from City Solicitor Field that the city is not empowered to enter into a contract with the Convert Construction Company without open competition. This concern proposed to erect a $200,000 plant at the gate house and supply electricity.

NORTH CENTRAL STATES.

COLUMBUS, O.—A Cleveland electrical expert employed to go over the local municipal light plant, recommends that reserve equipment to cost $129,500 be installed and $134,000 for extension of serivce that will take care of domestic lighting in 1,000 homes. This plan would substitute a 4,000-kilowatt turbine for the present 2,000-kilowatt and mean installing two 500-horsepower boilers. It is proposed to submit to the voters this fall the question of a bond issue of $265,000 to increase the capacity of the plant. J.

RUSH RUN, O.—The American Gas & Electric Company, which has a big modern electrical plant at Wheeling, and which now, through the local light company, is furnishing Steubenville's supply of electricity for light and power purposes, is to build a branch plant to supply its constantly increasing demand.

SANDUSKY, O.—A temporary injunction has been issued stopping work on the ornamental street-lighting system by property owners who object to the plan to pay for it by assessment. A decision will be handed down by the court in a short time. L.

SHOALS, IND.—The Public Service Commission has ordered the municipal water and electric plant at Shoals to sell $7,500 in common stock and $10,500 in preferred stock, and to use the proceeds to improve the plants of the municipality.

MUSKEGON, MICH.—The retail merchants on Terrace Street are discussing plans for extending the boulevard lighting system of Muskegon. Address city clerk.

MEDFORD, WIS.—The Medford Light & Power Company will soon enlarge its plant. M. A. Sprague, of Washburn, Wis., is interested.

PORTAGE, WIS.—The city has voted to purchase the electric light and power plant. This confirms the vote taken at the election on November 3, 1914.

BAY CITY, MICH. — The City Council plans to install a new white way. Address Mayor Kelton.

ELY, MINN.—The council may establish an improved electric-lighting system. Address village clerk.

AMES, IA. — Improvements are planned to the local system of the Iowa Telephone Company, including switchboard and underground conduits. Cost about $25,000.

CLARMONT, IOWA.—Plans are being considered by C. Miller & Sons to double output of the local electric plant, including the installation of a turbine water wheel and a 300-kilowatt generator, directly connected; add to power house, new flumes and tail race. Cost, $20,000.

FAIRBANK, IA.—An election will be held November 1 to vote on the question of issuing $6,500 bonds for electric light plant. Address city clerk.

MEXICO, MO.—Material will be purchased at once for enlarging the lighting system. Address E. R. Locke.

POPLAR BLUFF, MO.—The city will construct an electric light and power plant. Bids will be received November 3. Address H. H. Wilcox, city clerk.

HARDTNER, KANS.—A proposition was presented to the City Council, asking for a franchise for an electric light system, and was acted upon favorably. Address city clerk.

PRESTON, KANS.—Estimates are being prepared for a $7,000 electric light plant. Address town clerk.

AINSWORTH, NEB.—The Ainsworth City Council has advertised for bids for lighting the city.

MAGNET, NEB.—P. J. Sandberg is planning to purchase supplies and material for an electric light system and water plant.

DUBOIS, NEB.—An issue of $7,000 electric light bonds was voted recently.

PLYMOUTH, NEB.—The Commercial Club is considering the proposition of procuring electric lights for the village. Address Otto Dorn.

SOUTH CENTRAL STATES.

FLEMINGSBURG, KY.—The Flemingsburg Light & Ice Company has decided to install a new 2,300-volt alternator to take the place of old equipment, with the intention of supplying surrounding towns, as well as Flemingsburg. The new machine will necessitate changing the equipment in use in the city.

LOUISVILLE, KY.—A new substation for the distribution of light and power will be erected by the Louisville Gas & Electric Company at 1919 Stevens Avenue at a cost of $13,000.

GOLTRY, OKLA.—The city will vote on $10,000 bonds to install an electric light plant. Address mayor.

BRYAN, TEX.—Fountain Brothers have applied to the City Council for a franchise for the construction of an electric light and power plant here.

DALLAS, TEX.—The Dallas Union Terminal Company will soon begin the construction of its new electric power plant which will be located near the union station that is now being built.

DECATUR, TEX.—The municipal electric light and power plant will be improved and repaired at a cost of about $10,000.

GREENVILLE, TEX.—The municipal street-lighting system here will be extended.

SHERMAN, TEX.—City Manager Karl M. Mitchell is considering plans for enlarging the municipal electric light and power plant. Considerable new machinery will be installed.

WESTERN STATES.

CHOTEAU, MONT.—Residents of Hobson Addition have petitioned the City Council for the extension of electric-lighting systems to this district. Unofficially reported that the Council will make the extension.

RED CLIFF, COLO.—The Colorado Power Company has been granted a franchise to install a street-lighting system. Address manager.

PHOENIX, ARIZ.—The City Commission has rejected all bids received for new ornamental lighting standards and ordered that advertisement be made for new bids. Nearly 300 posts are needed.

OGDEN, UTAH.—Among the improvements contemplated by the Ogden, Logan & Idaho Railway Company is the construction of new car barns and repair shops at the estimated cost of $140,000, a passenger station at Logan to cost about $30,000 and freight yards at Ogden to cost about $40,000.

SALT LAKE CITY, UTAH.—In accordance with the provisions of the new special lighting-district law, the Board of City Commissioners unanimously passed a formal resolution declaring the intention of the city to create special lighting district No. 1. The city engineer is authorized to prepare plans and specifications for the special lighting system, and to prepare an estimate of cost of installation and maintenance for a term of three years. Address City Engineer Sylvester Q. Cannon.

BOISE, IDA.—March & Stite have filed with the Public Utilities Commission an application for a certificate of public convenience and necessity, giving them permission to install an electric power plant to serve Rockland, in Power County, with light and power. Two applications were filed, one for rights in Power County and the other in the town of Rockland. The territory to be developed is not being served by any company.

EVERETT, WASH.—A. D. Butler, of Seattle, recently filed with the County Clerk, Snohomish County, water-right claims on Jim Creek and the Stillaguamish River. Butler has also filed claims on streams where power might be produced including the Sauk River. He proposes to utilize 3,000 cubic feet per second from the Stillaguamish River and 1,000 cubic feet per second from Jim Creek. Reported that the development of the sites will be started at an early date.

MONTESANO, WASH.—A second application for an electric franchise in Grays Harbor County has been made by George H. Tilden and associates, Hoge Building, Seattle. The former application for franchise was rejected by the commissioners on the ground that there was no evidence to show that Tilden or his associates had title to their power site from which current was to be derived, same being located at Lake Cushman. Subsequent to this refusal, the state courts have ruled that the site at Cushman belongs to Tilden.

OLYMPIA, WASH. — The City Council unanimously voted to enter into a five-year contract for street lighting with the Olympia Light & Power Company.

SEQUIM, WASH. — The Sequim Light & Power Company, here, J. L. Keeler, president and treasurer, reports that in the immediate future it plans the extension of its light and power lines in Ranges 2, 3, 4, 5, in Clallam County.

TACOMA, WASH.—Application has been made to the commissioners of Pierce County by the Pacific Traction, Light & Power Company, for a franchise to extend its lines in the districts of Puyallup, Burnett, Alderton, McMillan and Sumner.

BUTTEVILLE, ORE.—The Molalla Electric Company, of Aurora, Ore., has been granted franchise and has entered into contract with the City Council whereby the Aurora company will install a lighting-system in Butteville, and will furnish current for business and residence lighting as well. The company proposes to extend immediately its transmission lines from Donald to Butteville.

PROPOSALS.

LIGHTING FIXTURES.—Sealed bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until November 15, for furnishing and installing lighting fixtures in the United States Postoffice at Orange, N. J., in accordance with drawings and specifications, copies of which may be had at the office of the Supervising Architect.

NAVY ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids on November 2 for the following. Intending bidders should write to the Bureau for copies of the schedule numbers desired: Schedule No. 8832, electric hoists; schedule No. 8894, single-conductor wire; schedule No. 8895, ammonium chloride for battery use.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 18,704. ELECTRICAL SUPPLIES.—An American consular officer in India reports that a company in his district desires to be placed in communication with American manufacturers and exporters of electrical supplies, such as lamps, globes, shades, brackets, fixtures, fans, etc. It is explained that cheap goods are generally popular in that district. The firm will arrange to pay cash against shipping documents forwarded through the foreign banks. Correspondence may be in English.

NO. 18,787. ANNUNCIATOR WIRE.—The Bureau has received a report from an American consular officer in Canada stating that a firm in his district desires to communicate with American manufacturers of annunciator wire such as is used in connection with electric bells. The size required is No. 18. It is stated that orders of 500 pounds would be placed.

NO. 18,789. ELECTRICAL HOUSEHOLD APPLIANCES.—The commercial attache of the Department of Commerce in England reports that a business man desires to represent American manufacturers or exporters of electrical household appliances, such as electric irons.

NEW INCORPORATIONS.

TOLEDO, O.—The Standard Electric Stove Company, $100,000 to $300,000.

PULASKI, WIS.—The Pulaski Light & Power Company has been incorporated with a capital of $20,000, by Frank Phillip and others.

WINTON, N. C.—The Ahoskie Light & Power Company has been incorporated with a capital of $50,000, by W. S. Herring and others.

BISMARCK, MO.—The Bismarck Electric Light & Power Company has been incorporated with a capital of $12,000, by G. A. Wahl and others.

TYRONE, OKLA.—The Tyrone Electric Light, Ice & Power Company has been incorporated with a capital of $10,000, by H. Gilmore, G. W. Riffe and others.

NEW YORK, N. Y.—Fort Wyane Electrical Contracting Company, Incorporated. Capital, $2,000.

FINANCIAL NOTES.

The Kentucky Utilities Company has closed a deal by which it takes over the plant and properties of the Cynthiana Electric Light Company, and has taken possession. Cynthiana is thirty miles distant from Lexington, and it is understood will be supplied from Lexington.

The annual meeting of the stockholders of the Consolidated Gas, Electric Light & Power Company, of Baltimore, was held in the executive offices of the company last week. Four directors were elected to fill the vacancies on the board. Those elected were: Howard Bruce, vice-president and general manager of the Bartlett-Hayward Company; Siegmund B. Sonneborn, of the firm of Henry Sonneborn & Company; Morton Otis, of London, England, a member of the banking firm of Aldred & Company, and Frank M. Tait, of New York.

Dividends.

	Term	Rate	Payable
Am. Rys., pf.	Q	1.75%	Nov. 15
Bellows Falls Pw., pf.	S	2.5 %	Nov. 1
Col. Ry., Pw. & Lt.	Q	1.25%	Nov. 1
Col. Ry., Pw. & Lt., Series B	Q	1.25%	Nov. 1
Com. Pw., Ry. & Lt., pf.	Q	1.5 %	Nov. 1
Com. Pw., Ry. & Lt., com.	Q	1 %	Nov. 1
Elec. Bond & Share	Q	2 %	Oct. 15
Elec. Bond & Share, pf.	Q	1.5 %	Nov. 1
Empire Dist. Elec., pf.	—	0.75%	Nov. 1
Ft. Worth Pw. & Lt., pf.	Q	1.75%	Nov. 1
Havana Elec. Ry., Lt. & Pw.	—	3 %	Nov. 13
Havana Elec. Ry., Lt. & Pw., pf.	Q	3 %	Nov. 13
Jacksonville Trac., pf.	Q	$0.75	Nov. 1
Keystone Tel., pf.	S	3 %	Nov. 1
Milwaukee Elec. Ry. & Lt., pf.	Q	1.5 %	Nov. 1
Sierra Pac. Elec., pf.	Q	1 %	Nov. 1
Third Ave. R. R.	Q	1 %	Jan. 1

Reports of Earnings.

WESTERN UNION.

The Western Union Telegraph Company report for the nine months ended September 30 (September estimated) compares as follows:

	1915	1914
Total revenues	$37,653,422	$35,486,659
Maintenance, repairs and reserve for depreciation	6,092,182	6,049,060
Operating expenses, taxes, etc.	23,931,590	24,499,985
Total expenses	30,023,772	30,549,045
Balance	7,629,650	4,937,614
Interest	1,001,836	1,002,938
Net income*	6,627,814	3,934,677

*Equal to 6.61 per cent on $99,786,759 outstanding stock for the period, or at yearly rate of 8.82 per cent.

AMERICAN TELEPHONE & TELEGRAPH.

The American Telephone & Telegraph Company report for the nine months ended September 30 compares as follows:

	1915	1914
Total earnings	$34,769,036	$34,602,915
Net	30,587,915	30,490,430
Interest	5,049,384	6,241,562
Dividends	21,592,195	20,679,165
Surplus	3,946,336	3,569,703

PERSONAL MENTION.

MR. A. W. EVANS has been appointed commercial manager in charge of the Athol (Mass.) Gas & Electric Company's business in that city and in Orange and Gardner.

PROF. A. E. KENNELLY, head of the graduate research department of electrical engineering at Harvard and Technology, Boston, addressed the first meeting of the Wireless Society, October 7, on the possibilities of improving the radio station at the Institute.

MR. C. F. NAGLE, superintendent of the Citizens' Electric Illuminating Company, of Pittston, Pa., was accidentally shot and seriously wounded on October 16 by a hunter who was shooting wild ducks along the Susquehanna River at Pittston. Mr. Nagle was at the plant of his company 100 yards away at the time of the accident.

MR. VERNE KENNEDY and MR. HILDING N. CARLSON have been appointed assistants in electrical engineering at the Massachusetts Institute of Technology, Boston, Mass., and MR. A. S. DANA, who was previously appointed research assistant in electrical engineering, was assigned to be part time assistant in the course on alternating currents.

MR. DANA H. HOWARD, superintendent of the advertising department of the Commonwealth Edison Company of Chicago, addressed the Des Moines Admen's Club at luncheon on October 12. He illustrated the value of different methods of advertising, displaying lantern-slide pictures. He said that it is as necessary for the seller to advertise as it is to have goods to sell.

MR. FIN GRAFF, Norwegian technical agent of Christiania, is at present in Chicago on his way to the Panama-Pacific International Exposition, to study electric heating and telephony. Mr. Graff spent considerable time in the factory of the Hughes Electric Heating Company, studying the Hughes ranges. Mr. Graff was one of the many out-of-town visitors to the Jovian convention held in Chicago last week, and particularly enjoyed the "Feast of Jupiter."

MR. R. P. BENEDICT has been chosen manager of the Electric Lighting Department of the city of Chicopee, Mass. For the past five years Mr. Benedict has been commercial manager for the Athol (Mass.) Gas & Electric Company, and prior to that was connected with the Stanley Electric Manufacturing Company, Pittsfield, Mass., the Pittsfield and the Northampton lighting companies and the R. W. Parks properties at Westfield, Mass. The Chicopee department operates a municipal plant which generates about 1,500,000 kilowatt-hours a year and supplies 1,400 commercial customers. Mr. C. W. Whiting, of Boston, has been temporary manager, pending the appointment of a permanent incumbent.

MR. JESSE LEE JONES, recently elected president of the American Institute of Metals, was born at Martins Ferry, O., in 1865. After his graduation from the high school at Martins Ferry, he served his apprenticeship in a gray-iron foundry and here laid the foundations for his subsequent metallurgical work. He graduated from the Ohio State University, at Columbus, in 1890 and soon thereafter took a position with the Junction Iron & Steel Company at Mingo Junction, O., (now a branch of the United States Steel Corporation) where he gained experience in connection with the manufacture of steel, blast-furnace work, etc. He later took up work as chief chemist of William Cramp & Sons, Philadelphia, Pa., where he remained for nine years. During this time he gained a very wide experience

Jesse L. Jones.

in general metallurgical work, having much to do with the manufacture of the various alloys manufactured by that company, in addition to carrying on the chemical control work. In 1903 Mr. Jones became connected with the Westinghouse Electric & Manufacturing Company, being attached to the manager of Works Department, his particular duties being in connection with the control of the manufacture of the various metals and alloys which are used in this company's product. Later Mr. Jones was attached to the Research Division of the Engineering Department and became chief chemist, but still paying particular attention to the various foundry problems. Mr. Jones has been a frequent contributor to the technical press on foundry matters and is author of the book on "Brass." In his present position Mr. Jones has the technical control of the manufacture of approximately 35 different alloys, in addition to having charge of all the chemical work done by the company. Mr. Jones' wide experience as a chemist and engineer and his sterling worth as a man, together with his energy and push, insure an active and successful administration of the American Institute of Metals for the coming year.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Oct. 18	Oct. 11
American Tel. & Tel. (New York)	124	123⅞
Commonwealth Edison (Chicago)	136	136
Edison Electric Illuminating (Boston)	239	241
Electric Storage Battery common (Philadelphia)	73	73
Electric Storage Battery preferred (Philadelphia)	73	73
General Electric (New York)	178¾	176
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	6¾	8
Massachusetts Electric preferred (Boston)	39	38
National Carbon common (Chicago)	150	150
National Carbon preferred (Chicago)	120	120
New England Telephone (Boston)	133	131½
Philadelphia Electric (Philadelphia)	26	25¾
Postal Telegraph and Cables common (New York)	78	76¼
Postal Telegraph and Cables preferred (New York)	65¼	65⅛
Western Union (New York)	78½	79
Westinghouse common (New York)	76	76
Westinghouse preferred (New York)	142¼	144

MR. GEORGE B. MULDAUR, the genial and efficient field representative of the Society for Electrical Development, Incorporated, was a visitor to Chicago last week, and has returned to New York for treatment for acute inflammatory rheumatism. Mr. Muldaur suffered a great deal during his extended trip covering the last four months, and succumbed to the indisposition, and was laid up in a hospital at San Francisco practically all of September. He is making a rapid recovery, and in all probability will be actively at work again in the near future.

MR. THOMAS A. EDISON was the guest of honor at the Panama-Pacific International Exposition this week, culminating in a specially appropriate celebration of Edison Day, October 21, the thirty-sixth anniversary of his invention of the incandescent lamp. A round of festivities was arranged, beginning with a special reception by a committee of prominent California men on his arrival at San Francisco. Later he was tendered a luncheon and presented with a medal by President C. C. Moore, of the Exposition. Following dinner he was escorted through the exposition grounds where a special illumination program was carried out in his honor; this included the most brilliant and beautiful electrical effects, also fireworks.

OBITUARY.

MR. ANDREW RADEL, prominent as an eastern electric traction builder, died of apoplexy at his home in Bridgeport, Conn., on October 15. He was born in Newark, N. J., 54 years ago. He was one of the leaders in the building and development of the Newark and South Orange street-railway lines, which later became a part of the great network of trolleys covering northern New Jersey. Shortly after coming to Bridgeport, he built the traction system of that city, which is now a part of the Connecticut Railway & Lighting Company. At the time of his death Mr. Radel was a director in the Newark & South Orange Traction Company, vice-president of the New Brunswick Traction Company, and president of the Seaview Railroad and Narragansett Company.

DATES AHEAD.

Independent Telephone Association of America. Annual convention, San Francisco, Cal., October 26-29. Secretary, W. S. Vivian, Chicago, Ill.

American Physical Society. Columbia University, New York City, October 30. Secretary, A. D. Cole, Columbus, O.

Electric Power Club. Homestead Hotel, Hot Springs, Va., November 8-10. Secretary, C. H. Roth, 1410 West Adams Street, Chicago, Ill.

Mississippi Electric Association. Annual convention, Hattiesburg, Miss., November 12-13. Secretary, H. F. Wheeler, Hattiesburg, Miss.

Electrical Supply Jobbers' Association. Quarterly meeting, Homestead Hotel, Hot Springs, Va., November 17-19. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

National Independent Telephone Association. Annual convention, Hotel La Salle, Chicago, December 8-10. Secretary, F. B. MacKinnon, Washington, D. C.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15, 1916. Secretary, J. C. Olsen, Cooper Union, New York, N. Y.

With the Electrical Manufacturers

Hughes Electric Heating Company, 211 West Schiller Street, Chicago, Ill., has been awarded the gold medal for its display of electric ranges and ovens at the Panama-Pacific International Exposition, San Francisco, Cal.

Belden Manufacturing Company, Western Avenue and Twenty-third Street, Chicago, Ill., has issued a new discount and price-list applying to its catalog No. 6, dealing with its large assortment of wires and cables.

American Cyanamid Company announces the opening of its general offices at 200 Fifth Avenue, New York, N. Y., on October 1. The Nashville and Buffalo offices were discontinued on that date. A southern office is maintained in the Walton Building, Atlanta, Ga.

Central Electric Company, 326 South Fifth Avenue, Chicago, Ill., has issued catalog No. 55, dealing with Alexalites. This catalog is very attractively illustrated by a large number of fine vignetted half-tones, showing a variety of new and handsome designs of these well known indirect lighting fixtures. Full data are given for each design.

Pass & Seymour, Incorporated, Solvay, N. Y., is sending out a memorandum relative to the supply of Swan strain relief caps and regular pendent caps on its various sockets. This is of value in connection with the new requirements of the National Electrical Code that socket bushings smaller than the three-eighths-inch type will not be approved for pendent work.

Westinghouse Lamp Company, 1261 Broadway, New York, N. Y., has issued a booklet entitled "Lighting that Makes the Home Attractive." This contains a large number of views in a typical home and gives many valuable suggestions for the artistic lighting of the various rooms at comparatively low cost. The views shown of several of the rooms give more than one method of lighting. The use of Westinghouse Mazda lamps is recommended for all parts of the home.

Weston Electrical Instrument Company, Newark, N. J., has issued a number of new bulletins dealing with its line of new electrodynamometer-type portable instruments. Bulletin 2002 describes the single-phase and direct-current wattmeter, model 310, and the polyphase wattmeter, model 329. Bulletin 2003 is devoted to the direct-current and alternating-current portable ammeters, model 370. Bulletin 2004 describes the direct-current and alternating-current portable voltmeters. In each of these bulletins the instruments are illustrated and described in great detail.

Dickinson Manufacturing Company, Springfield, Mass., has issued catalog No. 7, dealing with molded electrical insulations and sundry composition goods. These are phenolic condensation products and are modifications of the one known as "Condensite." Among these products are Stern-Condensite, Sternoid, Sternoid-A and a number of rubber substitutes and special compounds. These all have very desirable electrical characteristics and can be molded into an almost infinite variety of shapes. The Dickinson Manufacturing Company is prepared to mold electrical parts to specifications.

Roth Brothers & Company, 1410 West Adams Street, Chicago, Ill., has issued bulletin No. 212, dealing with home lighting plants, particularly for country homes. The cover has an attractive illustration of such a home brilliantly illuminated electrically. The bulletin describes the various parts of these equipments, including the engine, generator, storage battery, automatic battery-charging switch and voltage regulator. The various parts are illustrated; also the complete plant. These equipments are made in several sizes to meet the varying requirements of plants of this type.

Julius Andrae & Son Company, Milwaukee, Wis., recently celebrated the fifty-fifth anniversary of its starting in business. It was in the year 1860 that Julius Andrae, the founder and president of this well known electrical supply and manufacturing firm, started a blacksmith shop on West Water Street, Milwaukee. Gradually broadening out the scope of his business and steadily increasing its magnitude necessitated the removal of the establishment at least four times to larger quarters, each of which when occupied was considered to be adequate for all future needs. The company now has one of the finest business houses in the city, located at Broadway and Michigan Street. It also has four large warehouses in other portions of Milwaukee, which give it unsurpassed facilities as the largest electrical supply and jobbing house in the Northwest.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is supplying electrical equipment to several prominent paper mills: Crown Willamette Paper Company, Portland, Ore., will increase the capacity of its generating station at Oregon City by the installation of a Westinghouse 1,250-kilowatt water-

wheel driven alternating-current generator to operate in parallel with two smaller machines at present installed; the present switchboard equipment will be replaced with a six-panel board. American Writing Paper Company is about to start up a 550-horsepower Westinghouse motor at its Platner & Porter Division plant, Unionsville, Conn.; this motor will obtain power from the local electric light company, and will be used to supplement the water power. Berlin Mills Company, Berlin, N. H., ordered 20 alternating-current motors, aggregating 365 horsepower. Unity Paper Mills, Incorporated, having recently taken over the old property of the Potsdam Paper Company, Potsdam, N. Y., is bringing this mill up to date through the installation of electric motors.

Record of Electrical Patents

Issued by the United States Patent Office, October 12, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,156,046. **Safety System for Electric Railways.** P. L. Bailey, Indianapolis, Ind. Block signal system; signal wire extending beyond block is adapted to cut out car motor, the extension being controlled by car in block.

1,156,061. **Electric Typewriter.** M. C. Crawley, assignor to Addograph Co., Los Angeles, Cal. Typebars operated by electric motor.

1,156,064. **Electric Illumination.** H. Deschere, New York, N. Y. Series lamps have auxiliary filaments to prevent open circuit on breaking of service filament.

1,156,078. **Air-Vending Machine.** A. P. Holden and R. J. Copeland, Toronto, Ont., Canada. Coin-controlled, electric-motor-driven compressor.

1,156,089. **Insulator for Overhead Conductors of Electric Lines.** F. Libano, Trieste, Austria-Hungary. Details of trolley hanger.

1,156,113. **Azimuth and Other Indicator.** G. S. Tiffany, assignor to Gray National Telautograph Co., New York, N. Y. Electrical means operated on Wheatstone-bridge principle for causing movements of an indicator to follow movements of a member at a distance.

1,156,121. **Combination Switch.** A. F. Wise, assignor to H. C. Dunning and C. E. Dennis, Columbus, O. Particular structure of multiple-contact rotary switch with quick break.

1,156,126. **Time Switch.** J. M. Andersen, assignor to A. & J. M. Anderson Mfg. Co., Boston, Mass. Details of mechanism.

1,156,136. **Method of Operating Polyphase Motors.** H. W. Doubrava and J. Heineman, assignors to Wagner Electric Mfg. Co., St. Louis, Mo. In starting inducing conductors are distributed through more than 360 electrical degrees, the conductors being distributed over a smaller number of degrees under running conditions.

1,156,157. **Receiver.** O. M. Leich, assignor to Cracraft, Leich Electric Co., Genoa, Ill. Particular structure of telephone receiver having improved magnetic circuit.

1,156,163. **Manufacture of Insulators for High-Potential Electric Conductors.** F. M. Locke, Victor, N. Y. Formed by fusing a glass base and boron material into homogeneous body.

1,156,171. **Carbonizing Pipe-Bowls.** W. A. Paul, Moline, Ill. Electric heater inserted into smoking-pipe bowl closed against admission of air.

1,156,192. **Apparatus for Improving the Stability of Furnaces with Magnetically Extended Electric Arcs.** E. Troye, assignor to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Christiania, Norway. Steadily burning arc is secured in arc-disk furnace by providing stationary body of relatively great conductivity adjacent the electrodes.

1,156,201. **Electric Switch or Contactor.** T. E. Barnum, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Electromagnetically operated laminated brush and carbon break.

1,156,223. **Electric Laundry-Roll.** W. S. Hadaway, Jr., New Rochelle, N. Y. Comprises particular structure of electric heater.

1,156,226. **Recording Electric Meter.** A. Herz, Chicago, Ill. Recording apparatus controlled by variable resistance of selenium cells.

1,156,227. **Low-Resistance Vapor Electric Device.** P. C. Hewitt, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Positive electrode is located in region in which negative-electrode component of fall of potential occurs.

1,156,228. **Controlling Means for Vapor Apparatus.** P. C. Hewitt, assignor to Cooper Hewitt Electric Co. Mercury-arc rectifier with a condenser shunted between the anodes and A. C. terminals.

1,156,253. **Telephone System.** L. W. Stanton, Cleveland, O., assignor of one-half to F. W. Dunbar. Automatic mechanism for connecting calling lines with operators' sets.

1,156,255. **Combined Timer and Distributer.** A. L. Strahle, assignor of one-half to L. P. Byars, Benson, Nebr. Timer has wiping contacts.

1,156,257. **Gas or Vapor Electric Apparatus.** P. H. Thomas, assignor to Cooper Hewitt Electric Co. Vapor chamber created in central portion of W-shaped tube by vaporizing mercury therein, this driving out liquid mercury which forms seals at the ends.

1,156,258. **Cash-Register.** E. J. Von Pein, assignor to National Cash Register Co., Dayton, O. Motor switch controlled by key which controls connections of totalizers and driving mechanism.

1,156,270. **Trolley Wheel.** S. G. Buskard, assignor of one-half to L. Lyons, F. G. Mummery and H. Carpenter, Hamilton, Ont., Canada. Wheel-shaft lubrication.

1,156,282. **Electric Switch.** W. H. Farmer, assignor of one-third to H. I. Phinney, Boothbay Harbor, Me. Simple structure for connecting conductor ends.

1,156,288. **Electric Typewriter.** E. Hausberg, Des Moines, Ia. Key-controlled electromagnets operate typebars.

1,156,297. **Method of Assembling Cores of Electrical Apparatus.** E. R. Knight, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Laminated core is formed outside of machine and then forced into the yoke.

1,156,314. **Connector for Ground Terminals.** A. R. Rheinberger, St. Paul, Minn. Device for securely connecting line wire to ground rod.

1,156,315. **Electrode.** W. H. Rowley, University, Mo. Storage-battery plate comprises supporting grid carrying screen of metal, lead fiber forming uneven surface to which oxide of lead is applied.

1,156,316. **Process of Making Electrodes.** W. H. Rowley, St. Louis, Mo. Oxide of lead paste applied to frame is pressed and surface moisture partially removed and treated to bath of sulphuric acid.

1,156,317. **Electromedical Apparatus.** C. Santos and R. Boerner, assignors to Siemens & Halske A. G., Berlin, Germany. For diathermic treatment.

1,156,321. **Expression Device for Musical Instruments.** M. L. Severy and G. B. Sinclair, assignors to Choralcelo Co., Boston, Mass. Sonorous bodies actuated by impulses in electromagnets are controlled by resistances in the circuits.

1,156,334. **Electrical Signaling System and Apparatus.** C. W. Ward, Lakewood, O. Structure of trolley-actuated switch.

1,156,344. **Pull Pendent Switch.** F. A. Brogden, assignor to Pass & Seymour, Inc., Solvay, N. Y. Has detachable, two-part casing, switch mechanism being secured to one part and exposed by removal of other.

1,156,349. **Connector for Electrical Conductors.** H. E. Denham, Slayden, Tex. Axially spring-pressed member has binding post at one end connected with contact plate at other.

1,156,352. **Selective System and Apparatus.** J. F. Engle, Cleveland, O. Step-by-step signaling apparatus for party-line telephones.

1,156,364. **Induction Motor.** B. McCollum, Washington, D. C. Resistance in squirrel cage has temperature coefficient such that it has abrupt rise in resistance with starting currents.

1,156,366. **Collision-Prevention Device.** C. Martin, New York, N. Y. For vessels: feelers controlling signal circuit carried on floats in advance.

1,156,400. **Clock-Driven Controller.** C. I. Hall, assignor to Chicago Electric Meter Co., Chicago, Ill. Electromagnetically operated recording mechanism controlled by time mechanism.

1,156,412. **Electric Wattmeter.** P. M. Lincoln, Pittsburgh, Pa. Heating in two derived circuits compared, both circuits carrying superposed currents proportional to voltage and current respectively, the currents being opposed in one circuit and cumulative in the other.

1,156,413. **Volt-Ampere Meter.** P. M. Lincoln. For alternating circuits; several components of energy are separately measured and measurements combined to give joint indication.

1,156,414. **Electric Indicator.** P. M. Lincoln. Ammeter operating by differential temperature changes between two chambers, one of which is electrically heated.

1,156,415. **Electrical Controlling Apparatus.** D. L. Lindquist, assignor to Otis Elevator Co., New York, N. Y. For hoisting machinery; has auxiliary slow-down shunt field with resistance controlled to slow down at different rates according to direction of movement.

1,156,416. **Telephone-Exchange System.** F. R. McBerty, assignor to Western Electric Co., New York, N. Y. Comprises step-by-step switch intermittently connected with continuously operated power device by electromagnet controlled by sender.

1,156,422. **Metal Pole.** C. L. Michod, Chicago, Ill. Wire-supporting pole built up of structural iron.

1,156,426. **Apparatus for Electric Welding.** T. E. Murray, New York, N. Y. A number of pairs of pieces to be welded are connected in parallel with the current source and whole current may be sent through one pair, the time periods during which the circuits may be closed being automatically determined.

1,156,433. **Hydraulic Elevator.** C. R. Pratt, assignor to Otis Elevator Co. Electrically controlled differential mechanism controls power connection of hoisting drum.

1,156,442. **Insulator.** L. Steinberger, Brooklyn, N. Y. Structure of suspension insulator.

1,156,450. **Cord Circuit for Telephone System.** B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Arrangement of relays controlling supervisory signal.

1,156,452. **Insulating Composition.** L. H. Baekeland, assignor to General Bakelite Co., New York, N. Y. For impregnating coils, etc.; comprises phenolic condensation product, which is fluid at normal temperatures and infusible and elastic at higher temperatures.

1,156,453. **Signaling System for Automobiles or the Like.** E. T. Banes, Ogontz, Pa. Tail light controlled in response to movements of auxiliary carbureter air-valve.

1,156,454. **Electric Lighting Fixture.** G. W. Bayley, assignor to Bayley & Sons, Inc., Brooklyn, N. Y. Paneled shade with dish suspended therefrom.

1,156,473. **Shade-Holder.** G. A. Gauthier, assignor to Arrow Electric Co., Hartford, Conn. Holder secured to sleeve about socket by fingers forced into sleeve openings by sliding collar.

1,156,475. **Automatic Telephone-Exchange System.** C. L. Goodrum, assignor to Western Electric Co., New York, N. Y. Has provision for selectively calling subscribers on party lines.

1,156,477. **Lighting Apparatus.** W. M. Grosvenor, Grantwood, N. J. Structure mounted in wall lights several compartments.

1,156,481. **Electrical Controlling Apparatus.** J. D. Ihlder, assignor to Otis Elevator Co. Slowing down mechanism for electric motor controlled manually and by load magnet has effect automatically made variable with motor speed.

1,156,484. **System of Motor Control.** S. H. Keefer, assignor to Niles-Bement-Pond Co., Jersey City, N. J. Particular manner of controlling direction of rotation and acceleration of motor.

1,156,491. **Frequency-Indicator.** D. R. Price, assignor to General Electric Co., Schenectady, N. Y. One of two relatively movable elements has two opposed wind-

ings tuned to different frequencies, acting upon the other member, with means for accentuating the torque of a winding when its frequency is greatly departed from.

1,156,492. Method of Drawing Refractory Materials for Incandescent Lamps. H. C. G. Remane, assignor to General Electric Co. Tungsten wire is coated with sulphate of tungsten before drawing and sulphate is decomposed afterward.

1,156,496. Process for Annealing Magnetic Material. W. E. Ruder, assignor to General Electric Co. Silicon steel is heated in nonoxidizing atmosphere and cooled in air.

1,156,502. Arc Welding. J. A. Seede, assignor to General Electric Co. Electrodes connected to opposite sides of current source are alternately used.

1,156,509. Microphone. E. Weintraub and L. W. Miller, assignors to General Electric Co. Contains hard granules made by carbonizing resinous phenolic condensation product.

1,156,524. Selenium Cell Especially Adapted for Use in Connection with Telegraphy. K. C. Cox, Norfolk Island. Has alternate conducting and insulating plates with selenium carried by insulating plates and contacting with conducting plates.

1,156,526. Testing Cutout for Arc Lamps. E. J. Guay, assignor to General Electric Co. Has testing shunt across arc opened by arc-starting means and spark gap in shunt with arc gap, the spark gap being reduced when arc fails to start.

1,156,528. Photographic Printing Apparatus. T. Harbers, Deipzig, Germany. Compact apparatus contained in box, for printing by electric light.

1,156,536 and 1,156,537. Illuminating Apparatus. W. Lumley, assignor to General Electric Co. First patent: Bowl made of superposed rings. Second patent: Similar to 1,156,536, the bowl being made up of overlapping sections.

1,156,542. Electric Switch. E. B. Merriam, assignor to General Electric Co. Oil switch: contact moved laterally through opening in arc-restraining bell.

1,156,560. Incandescent-Electric-Lamp Fixture. E. G. Smith and F. J. Mantel, assignors to Crouse-Hinds Co., Syracuse, N. Y. For lighting car berths, etc., lamp being movable into and out of wall recess.

1,156,583. Electric-Conduit Fitting. C. H. Pissel and F. Smith, assignors to Crouse-Hinds Co. Box for mounting electrical appliance and switch and adapted for securing to conduit.

1,156,588. Electric-Light Fixture. W. J. Bohan, St. Paul, Minn. Simple integral structure of pedestal and reflector for table lamp.

1,156,594. Electric-Generator-Operating Device. W. S. Fiscus, Steubenville, O. Generator driven by turbine in engine exhaust of automobile.

1,156,610. Elevator-Despatcher. G. W. Meyers, Chicago, Ill. Gearing and circuit arrangements for electrically operated signal element.

1,156,624. Duplex Lighting System. J. R. Pagin, Valparaiso, Ind. Headlight utilizes both gas and electric lights.

1,156,625. Wireless Receiving Improvement. G. W. Pickard, assignor to Wireless Specialty Apparatus Co., New York, N. Y. Arrangement of magnetic amplifier.

1,156,626. Telephone System. R. L. Quass, assignor to Western Electric Co. Automatic ringing controlled by link conductors.

1,156,630. Method of and Means for Measuring the Flow of Fluids. M. A. Savage, assignor to General Electric Co. Variation of resistance of electrically heated conductor in conduit is observed.

1,156,635. Flow-Meter. J. W. Shepardson, assignor to General Electric Co. Gaseous flow in conduit is measured by varying resistance in wattmeter circuit associated with Venturi tube.

1,156,636. Telephone Repeater. H. E. Shreeve, assignor to Western Electric Co. Magnetically operated microphone adapted to radiate heat and prevent packing of granules.

1,156,638. Flow-Meter. L. A. Simmons, assignor to General Electric Co. Conduit flow measured by electric current regulated to maintain resistance element in conduit at constant temperature.

1,156,639. Dynamo-Electric Machine. C. W. Starker, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Structure of laminated stator.

1,156,645. Dynamo-Electric Machine. M. Walker, assignor to Westinghouse Electric & Mfg. Co. Structure of field magnet effecting particular distribution of magnetism in direct-current machine or converter, to improve commutation.

1,156,650. Basing Incandescent Lamps. G. Wright, assignor to General Electric Co. Base is detachably clamped to bulb.

1,156,655. Circuit-Interrupting Device. W. M. Austin and J. N. Mahoney, assignors to Westinghouse Electric & Mfg. Co. Automatic circuit-breaker having gang of contacting arms operated together and an independent contacting arm.

1,156,656. Motor-Control System. H. L. Beach, assignor to Westinghouse Electric & Mfg. Co. For controlling two or more series-wound motors by altering relative connections of their elements.

1,156,660. Method and Apparatus for Measuring the Flow of Fluids. E. J. Berg, assignor to General Electric Co. Modification of No. 1,156,638.

1,156,666. Electrolytic Rectifier. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Arrangement for cooling of electrodes.

1,156,668. Electric Furnace. E. F. Collins, assignor to General Electric Co. Has resistance heaters at top and bottom of heating chamber, the top being nonoxidizable and having negative temperature-coefficient and higher resistance when cool than the bottom heater.

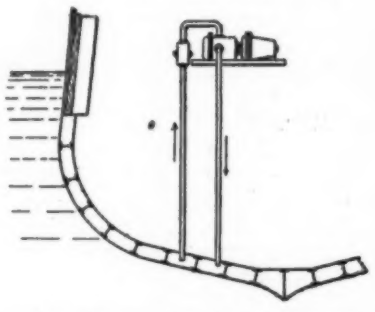
1,156,671. Electromagnetic Relay. E. B. Craft, assignor to Western Electric Co. Flat structure occupying small lateral space.

1,156,675. Dynamo-Electric Machine. H. F. T. Erhen and W. J. Delles, assignors to General Electric Co. Structure of field member having compensating winding.

1,156,677. Apparatus for the Transmission of Energy by Electric Oscillation. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Wireless receiving system.

1,156,679. Method of Changing the Composition of Iron and Steel. B. Ford, Philadelphia, Pa. Iron and steel carburized by melting in chamber from which air is excluded, molten metal being covered with carbon-supplying material and electrically maintained in molten condition.

1,156,680. Temperature-Indicator. C. Le G. Fortescue, assignor to Westinghouse Electric & Mfg. Co. Temperature of oil-immersed transformer indicated by thermometer subjected to current of device and immersed in the oil.



No. 1,156,829.—Cooling Marine Generator.

1,156,681. Electric Switch. H. G. French, assignor to General Electric Co. Locking device for knife-blade switch.

1,156,682. Motor-Control System. E. A. Hanff, assignor to Westinghouse Electric & Mfg. Co. For a number of series-wound motors.

1,156,686. Negative-Pole Plate for Secondary or Storage Batteries. G. M. Howard, Philadelphia, Pa. Structure adapted to receive charge readily which may be safely handled and will not heat when immersed in electrolyte, active material being dry metallic lead bound with sulphate of lead and free from oxide.

1,156,688. Electric Railway-Signal. J. B. Howell, Leavenworth, Kans. Trolley-controlled block-signal system.

1,156,696. Electrode. C. R. Krueger, assignor to General Electric Co. For arc lights: contains white flaming material and a steadier composed principally of a lithium compound.

1,156,705. Fire-Alarm Box. A. Mozdziers, Shelton, Conn. Arrangement of hand entrance and contacts.

1,156,708. Transformer Casing. E. G. Reed, assignor to Westinghouse Electric & Mfg. Co. Has cast-iron body and end members with external cooling tubes passing between plates cast in end members.

1,156,710. Method of Making Terminal Devices. B. P. Rowe, assignor to Westinghouse Electric & Mfg. Co. Formed from a sheet-metal tube.

1,156,711. Armature Winding. Y. Sakai, assignor to Westinghouse Electric & Mfg. Co. Two windings of different pitch have corresponding points connected together at ends of armature.

1,156,715. Electro-Osmotical Filter Press. B. Schwerin, assignor to Gesellschaft für Elektro-Osmose M. B. H., Frankfort-on-the-Main, Germany. Comprises perforated electrodes having filter cloths on their adjacent sides, constant volume between them, and device for supplying suspension to the space.

1,156,717. Automatic Fire-Alarm. J. B. Smith, Manchester, N. H. Weight closes contacts on fusing of support.

1,156,727. Electric Fitting. C. Wagner, assignor to Bryant Electric Co., Bridgeport, Conn. Switch, wire conduits, casing, etc., in structure simulating candle.

1,156,782. Device for Under-Water Exploration. C. F. Jenkins, Washington, D. C. Rigid tube is detachably secured to ship side by electromagnet.

1,156,796, 1,156,797 and 1,156,799. Spark Plug. J. W. Meaker, Detroit, Mich. First patent: particular integral structure insuring proper spark gap. Second and third patents: particular structures of case and insulating body.

1,156,809. Burglar-Alarm Bolt. T. L. Pidgeon, St. Barnebe, Que., Canada. When sliding-door bolt is rocked, alarm circuit is closed.

1,156,825. Gas or Vapor Electric Apparatus. P. H. Thomas, assignor to Cooper Hewitt Electric Co. W-shaped mercury-vapor lamp is steadied by permitting escape of vapor, on too great pressure, from central operating portion to end condensing chambers.

1,156,826. Electrolytic Meter. J. N. Tuttle, assignor to General Electric Co. Has mercury anode supported on diaphragm of silk.

1,156,827. Electric Meter. J. Vivell, assignor to General Electric Co. Time is recorded during which metered energy exceeds certain value.

1,156,829. Cooling Device for Electrical Machines Mounted on Vessels. H. Weiss, Vienna, Austria-Hungary. Apparatus has air jacket communicating with air chamber between inner and outer shells of hull. (See cut.)

1,156,862. Pneumatic-Tire Gauge. R. C. Sibley, Boston, Mass. Pressure gauge on wheel electrically controls telltale on vehicle body.

1,156,864. Computing Weighing Apparatus. H. A. Carpenter and A. W. Warner, assignors to Riter-Conley Mfg. Co., Pittsburgh, Pa. Motor-shifted weight controlled by switch mechanism from a single point to provide gross and tare weights, the switch mechanism being controlled by a scale beam.

1,156,865. Sound and Light Amplifier. H. J. Farrar, assignor to Universal High Power Telephone Co., King County, Wash. Comprises telephone receiver and lamp, the light and sound being delivered through same horn-like structure.

1,156,867. Universal Sound-Transmitting Means. P. J. Hackett, assignor to Universal High Power Telephone Co. A number of particularly constructed microphones connected by sound tubes with a common source of sound.

Patents Expired.

The following United States electrical patents expired on October 18, 1915:

612,410. Electric Trolley Device. A. J. Gairing, Johnstown, Pa.

612,426. Electric Meter. W. D. Marks and G. R. Green, Philadelphia, Pa.

612,441. Electric Time Alarm. H. D. Tenny, Milford, Mich.

612,457. Electric Railway. C. H. Myers, Buffalo, N. Y.

612,556. Electric Arc Lamp. C. A. Vigreux and L. V. Brillie, Levallois-Perret, France.

612,560. Electric Lamp Socket. J. E. Criggal, Newark, N. J.

612,629. Means for Controlling Operation of Electric Motors. J. D. Ihlder, Yonkers, N. Y.

612,644. Depressible-Rail System for Electrical Railways. W. Grunow, Jr., Bridgeport, Conn.

612,649. Battery Electrode. H. S. Lloyd, Philadelphia, Pa.

612,670. Electric-Cable Switch. A. Norman, Toronto, Canada.

612,681. Telephone-Exchange Mechanism. H. P. Snow, Erie, Pa.

612,696. Rail Joint for Electric Railways. M. Barschall, Berlin, Germany.

612,702. Automatic Electrically Controlled Railway Switch. R. V. Cheatham, Louisville, Ky.

612,708. Electric Signaling Apparatus. W. E. Decrow, Boston, Mass.

612,781. Electric Meter or Indicator. W. D. Marks, Philadelphia, Pa.

612,782. Coin-Actuated Signal Apparatus. H. R. Mason, Ludington, Mich.

612,789. Electric Self-Loading Street-Cleaning Car. A. J. Reynolds, Worcester, Mass.